TRAINING OF KRPs IN EVALUATION TECHNIQUES IN SCIENCE AT Sr. SECONDARY LEVEL.

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PREFACE

Teaching and testing are the significant component of every instructional programme. They are dovetailed to the instructional objectives which provide direction for both. In evaluating pupil's performance and to bring objectivity Punjab Board of School Education has introduced new approach of framing different types of questions.

New pattern of examination and paper setting enhanced the objectivity, reliability and validity. In evaluation process there is a need of systematic planning and continuous improvement for preparation of design, blue print and question paper. There is a need to provide training to the teachers about preparation of question paper on their own according to the objectives and norms set up by the Board of School Education, Punjab. As desired by SISE, Punjab a training package was prepared for designing of blue print and question paper. This will be used to provide training to key persons of the state.

We are thankful to Prof. A. B. Saxena, Principal, RIE, Ajmer and Prof. H. C. Jain, Head DESM, RIE, Ajmer for giving suggestions during planning of the PAC approved programme and providing help during execution.

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INTRODUCTION

The Board of Secondary Education Punjab has already introduced a number of changes in the examinations conducted by it, with a view of improving their reliability, validity and objectivity as also to improve their pedagogical value. This has been done by improving questions, question papers, scoring procedures and a lot of other things related to examination. Overall options have been completely replaced by internal options in a few questions. The content coverage has been sufficiently increased objectivity. It has been built in by introducing objective type questions and by providing marking scheme for different types of questions. Particular attention has been paid to see that all the objectives of instruction, which can be tested through written examination, are included in the question paper.

However, dissemination of new ideas to a very large number of Sr. secondary school teacher is itself a major task. But this has to be accomplished, for no education reform can take firm hold unless the idea behind it is understand by those who are going to practice it. This necessitates the organization of a large number of orientation workshops, which in turn require a good team of workers in the field of evaluation.

CHAPTER – I

1.0 CONCEPT OF EDUCATIONAL EVALUATION

Education is a process of effecting desirable changes in pupil's behaviour The direction of this change is determined by the goals or objective of teaching. By evaluation it mean the scheme of collecting evidences of behaviour change and judging the direction and extent of such changes. This necessitates a clear understanding of instructional objectives both for the purpose of providing worth while learning activities and for testing

1.1 OBJECTIVES, LEARNING ACTIVITIES AND EVALUATION.

The sum total of expected changes in the behaviour of pupil's in referred to as educational objectives. Such expectation is based on our judgement of the desirability of the changes in the light of the national, social and individual needs of the pupil. The whole educative process is an endeavor to achieve these goals as best as possible.

There is an intimate relationship between objectives and learning activities. Just as the objectives are diverse, the learning activities are also diverse. The same objective may be realized through a never of activities, so also the same activity may lead to the realization of more than one objective. But it should be possible to identify those activities that are most likely to contribute to particular objectives. The extent to which learning – activities result in experiences which lead to the realization of particular objectives. The extent to which learning – activities result in experiences which lead to the realization of particular objectives is determined by evaluation.

1.2 REQUISITES OF A SOUND EVALUATION PROGRAMME:

After ensuring the clear specification of objectives and objective based Instructional programme of a course which is supported by the information gained by pre-testing taking that course. It is necessary to organize the evaluation programme keeping the following essentials in view.

It should be continuous. As the change is a continuous process, it is necessary to know when it is taking place rather than knowing it after much harm is done. This will help in developing and using remedial measures.

It should be accurate. This will be done by preparing evaluation instruments which are valid, reliable an which could be used objectively.

It should be comprehensive covering all the objectives and content.

To give any judgement about pupil achievement without comprehensive assessment may be more harm than good to the cause of education.

It should be supported by suitable recording and reporting procedure Much of the valuable information will be wasted if not recorded in a meaningful way and kept ready for use at the right time.

Proper reporting procedures should also be developed and used.

The valuable data available through the above process should be interpreted and this should be used for betterment of the process of education in all its aspects through appropriate feed back procedures.

1.3 SUBJECT CONTENT AND EVALUATION:

In the context of the broad goals of education each subject has its specific objectives and each topic of the subject contributes to the realization of one or more of the specific objectives. This is possible as each topic of the subject result in specific behaviour changes in the desired direction. Continuous assessment of these changes in evaluation. The adequacy or the suitability of the subject content, as well as of the learning activities in relation to the objectives, come within the purview of an evaluation programme.

1.4 EXAMINATION, MEASUREMENT AND EVALUATION:

Educational objectives are not limited to the pupils academic achievement in the various school subjects. It relates to the total pupil grown. Obviously this involves a variety of experiences inside and outside the classroom. For a proper assessment of this manifold a growth of the pupils a variety of tools and techniques becomes necessary evaluation, in other wards, needs to be comprehensive.

Out of many tools of evaluation one of the very common and universally accepted is examination Written examination is a technique which is used at periodic intervals. The effectiveness of this tool and the technique depends upon the extent of its sampling of the subject content on the one hand and the objectives on the other. This is referred to as coverage of content and of objection

Written examination may be supplemented by other techniques like the practical and the oral tests These may cover a few more objectives but that is not all other objectives have to be evaluated by other tools and techniques like observation, raring scale, inventories etc Evaluation therefore needs the use of a variety of tools and techniques.

Educational measurement is an estimation of specific changes in the pupils behaviour This does not involve any value judgments and as such it is not related to the goals But when this measurement is goal directed and supplemented by interpretation of value judgements it becomes part of evaluation

1.5 PURPOSE OF EVALUATION:

A number of important purpose are served by evaluation which ultimately contribute to the improvement of the instructional methods, text books, the curriculum and even an advancement of our educational goals. Evaluation helps us to set tasks and goals which are higher than what we aspired for earlier, thus giving leadership in education

Evaluation is helpful to the teacher and the taught The teacher comes to know how far his teaching is successful or his methodology effective The pupil also know where he is and how far his efforts have become successful.

Evaluation therefore implies objective based instruction and continuous assessment of the progress of the pupil, leading to the improvement of instruction and learning which in turn contribute to the total growth of the child

CHAPTER – II

2.0 FORMULATION OF INSTRUCTIONAL OBJECTIVES:

Evaluation is a process of making value judgement. As such, it implies that there is some reference point against which the value of a particular achievement is to be ascertained This reference point is the typical behaviour of the individual as we visualize him in the near future As a result of educating the pupils, they acquire a particular type of behaviour, which represents the desirable changes that we expect as a result of our instructional efforts Further whenever we think of evaluating the effectiveness of the educational process, we simply want to know the changes. Which are brought about in the behaviour of the individual desirable changes or the expected learning out comes which become the focus of instructional programme need to be determined very carefully

There are various empherical approaches, which can help us to determine the type of behaviours which are to be brought about in the pupils.

The job or activity analysis may be used for this purpose what a person does under what condition is called the job analysis, there by indicating the demands upon the performer. This provides the basis for instruction critical influence technique is a further refinement of the job analysis technique. Critical behaviours are those which differentiates between successed the failures of the job. Diagnostic studies of performance can also help us to point out the difference between the good and the performance can also help us to point out the difference between the good and the poor performers on a particular task and this difference in the behaviour will give due to the needed behaviour statistical methods are helpful in noting differences in the behaviour of the individuals who are good on a set of task and those who are poor on the same job on the other hand

However, if we depend on these empirical approaches, we become servant of tools rather than the master of these It is better, therefore, that significance of the activity in which the individual is supposed to be involved must be considered. This brings in the role of values. The concept of the good and desirable should determined the choice of activity.

(i) Connotation of Educational Objective:

An educational objective is a desired change in the behaviour a person who under goes education. But it is not what a teacher does, It is not the course content and it is at the same time not a fundamental life, value although it is a product of value judgement It represents the end point towards which action is directed the change is what the student knows, thinks, feels, represent learning out comes

It is a normative concept because it carries implication of the good or the desirable and at the same time reflects purposefulness of the educational process. Instructional objective represents the first and the last step in the prices of education. It is the first step because it is the starting point for the curriculum planning and instruction It is the last step because the whole process of education in validated against the objectives

It is, therefore, concerned with the product of learning rather than process of learning. The relationship of the end product (objective) with the process (learning experience) can be represented as under:-

Learning Experience → Learning Outcomes
(Process) (Product)

2.1 SIGNIFICANCE OF EDUCATIONAL OBJECTIVES:

The important objectives have the following objectives -

1. Objectives indicate the direction of growth.
2. They help in developing curriculum
3. They provide planning and organization of learning experiences
4. They form link between teachers, testers, parents and students
5. They provide basis for evaluation procedures.
6. Whole process of education can be validated against this.

2.2 SOURCES OF EDUCATIONAL OBJECTIVES:

Following are the three major determinants of educational objectives·

(i) Information about students (Need of the Learner)

Students lack certain important information, and certain appropriate habits face certain problems and difficulties, may lack breath of interest and be wanting in certain types of attitudes etc. careful study of the students needs will provide good information for deciding the objectives of curriculum

(ii) Investigation of Contemporary Life (Need of the Society):

Conditions and problems of contemporary life indicate values, the demands and commands of the society in making the young pupils to adjust to the changing and challenging conditions of the time. This includes the activities that they will be expected to perform, problems, they are likely to face, the difficulties they will run up against opportunities for self-service and self realization etc. are to be taken care of such an analysis of our present life reveals the kind of behaviours that our students should develop in order to become better citizen of tomorrow

2.3 ORGANISATION OF OBJECTIVES:

When the educational objectives are viewed as learning outcomes, they can be categorized in terms of various dimension on the basis of degree of generality, objectives may be classified as general and specific.

The tripartite classifications represents three domains concerning human development. Thinking, feeling and doing have been considered essential aspects in human development. On which taxonomy of educational objectives has been developed. Taxonomy of educational objectives cognitive domain was developed by Dr. B.S.Bloom.

Following table indicates the various objectives in hierarchical order under all the three domains:

(Cognitive)	**(Affective)**	**(Psychomotor)**
evaluation		
Synthesis	Characterisation	Naturalisation
Analysis	Organisation	Coordination
Application	Valuing	Control
Comprehension	Responding	Manipulation
Knowledge	Receiving	Initiation
	Exposition	

Exposition means exposing the pupil to a situation resulting in experience that brings changes in the behaviour

2.4 INSTRUCTIONAL OBJECTIVES IN SCIENCE:

Objective 1.0

The pupil acquire KNOWLEDGE of facts, concepts, term, principles and processes in the field of Science.

Specifications:

The Pupil

2 1 Recalls terms facts, principles etc.

2 2 Recognizes terms facts, principles etc.

Objective 2.0

The pupil develop UNDERSTANDING of facts, concepts, terms, principles and processes in the field of Science.

Specifications.

The Pupil

2 1 Locates errors in a given diagram specimen, sample, principle, statement etc.

2 2 Corrects errors in a given diagram, principle, specimen, sample, statement etc.

2 3 Selects appropriate things or materials or specimen or sample with a purpose

2.4 Uses symbols for words and words for symbols

2 5 Find selects appropriate units to express various physical quantities

2.6 Classify substances (living and non living terms etc. into given groups.

2.7 Illustrate terms, concepts etc. by suitable example from familiar situation
2.8 Recognizes proper sequence in a given process.
2.9 Compares and contrasts the related concepts with a view to find out similarities or dissimilarities between them.
2.10 Sees causes for a given effect and vice – versa.
2.11 Expresses a given scientific idea or principles in his own language in different ways.
2.12 Decides an precautions to be observed in a given experiment or situation.
2.13 Given uses of various facts concept theory appliances known to him.
2.14 Raises a query about a given principles, phenomenon or statement
2.15 Finds sees the adequacy or superfluity of given data
2.16 Sees relationship among the various parts of process.
2.17 Verifies the principle under known situation.
2.18 Give conclusion from known fact
2.19 Give example of different phenomenon.

Objective 3.0

The pupil applies knowledge of Sciences to get the solution of unfamiliar situations

Specifications.

The pupil

3.1 Identifies criteria in a given situation in a given classification.
3.2 Suggests a plan for modification periods
3.3 Generalizes from the given data.
3.4 Find cause effect and any other relationship in novel situation
3.5 Predicts from the given data.
3.6 Verifies the prediction.

Objective 4.0

The pupil develops skills in

1. Drawing diagrams, charts etc.
2. Performing scientific experiments
3. Making model.

Specification:.

4A1 Draws neat and accurate diagrams.
4A2 Lables different parts.
4A3 Prepares charts and sketches.
4A4 Selects appropriate scales.
4A5 Reads charts with correctness and quickness

(B) Experimental Skill

The Pupil

4B1 Plans the arrangement of the apparatus
4B2 Checks the instruments
4B3 Carries out simple repairs

4B4 Arranges the apparatus in a planned manner
4B5 Use equipment within limitations.
4B6 Records relevant data accurately
4B7 Take observation of volume, weights etc.

Objective 5.0

The pupil develops INTEREST in collecting and reading scientific literature inventing and improvising scientific tools, undertaking scientific pursuits and observation

Specifications

The pupil

5 1 Voluntarily goes to the library and spends his leisure time in reading scientific literature.
5.2 If his own, contributes articles on topic of scientific interest.
5 3 Seeks pleasure and delight in preparing models, tools.
5.4 Actively participates in various scientific activities, science fairs, science exhibitions, science clubs, field-trips etc
5.5 Seeks opportunity in observing and studying natural and man made surrounding.

The pupil develops the scientific attitude and higher value of life through the study of physics.

Specifications

The pupil

6.1 Records and interprets his observation honestly.
6.2 Discuss the problems and processes in a cool and calm manner.
6.3 Willingly accepts adopts new ideas and other people's points of view in a unbiased manner.
6.4 Shows a sense of accommodations and personal involvement.
6.5 Devices intellectual satisfaction.
6.6 Shows eagerness to know and understand the environment around him.

Objective 7.0

The pupil develops a sense of APPRECIATION in respect of the following:

A. Significance of various scientific discoveries and inventions and their impact on human life.
B. Sacrifices, services and efforts made and hardship and sufferings undergone in the cause of discoveries.
C. Wonders of nature such as vastness of time, space and energy on one hand and minuteness of the atomic world.

Specifications:

The pupil

7.1 Expresses his joy, excitement and thrill at every scientific achievement.
7.2 Shows his respect and administration for the great men of science

CHAPTER – III

3.0 FRAMING OF OBJECTIVE BASED QUESTIONS OF DIFFERENT FORMS:

INTRODUCTION

The question paper is the most important and invariably used tool of measurement That is why, all efforts are to be made to refine the question paper individual questions would, therefore, have to be framed in such a way that when put together in the form of a question paper, they fulfill all the conditions of a good measuring instrument. Whatever the form of questions may be, all of them must conform to the characteristics of a good question

3.1 WHAT IS A QUESTION:

A question is a request to the student to let the examiner know his behavioural outcome with reference to a particular ability and a particular area of content. In other words, a question is to seek evidences on the behavioural changes brought about through preplanned instructional programme

3.2 CHARACTERISTICS OF GOOD QUESTIONS:

1. Objective:

A good question should be framed on a predetermined objective and it should test it effectively. The essay type question and times short answer question may test more than one objective. It may also test one or more specification of a particular objective on which that question in based case has to be taken that a question tests the same ability. Which it is designed to test and not some other ability. More ever as far as possible, writing questions testing; single objectives based on single specification should be encouraged

2. Content

The content of a question is closely related to the objective being tested. The framer of the question has, therefore, to take into account the topic or the such topic he is going to test. He should also see the question examples exactly the same area of content which he wants to test.

3. Form

Essay type, short answer type and objective type questions are the main forms in use. In a question the form depends considerably on the kind of ability as well as the content to be tested. Some forms are more suited to test abilities like organization of thoughts, interpreting, commenting, etc. Therefore, a judicious use of the appropriate form of question will have to be made while setting questions.

4. Language:

To ensure objectivity in evaluation then is a need for using clear precise and unambiguous language while framing questions use of unfamiliar and difficult terminology may be avoided, so that the comprehension of the question itself may not become a problem to the students. The question should be so worded that by and large all students may make the some meaning out of it here special case may be taken in using directional words like write short notes on, write an account of, what do you know of, etc They should not be used indiscriminately

5. Structuring the Situation:

In writing items selection of appropriate situation is an important step. Text book situation is all-right in testing knowledge Other situation discussed in the class may be suitable to test knowledge or understanding. But to text application of knowledge, some new situations have to be provided. Although in such cases, situations go beyond the text book yet they should be in keeping with the ability levels of students.

6. Difficulty Level:

While writing a question the setter should be conscious of the difficulty level of the question in relation to the ability of pupils for whom the question is meant The difficulty level of a question usually depends upon the complexity of mental processes involved, the area of the content to be tested, and the time available to answer it. It can be estimated fairly well by experienced teachers. Actual difficulty index of course, is obtained only after the question in really tired out and analysed.

7. Discriminating Value:

It is not possible to estimate the discriminating value of a question under it is tried out. Nevertheless when some novel situations are involved and common place questions are avoid, the questions definitely go a long way in discriminating bright students from the poor once. Questions at either extremes of the difficulty continue are poor discriminators while those in the middle have been found to be good in this respect.

8. Delimiting the Scope of the Answer:

The item-writer should see that while framing a question be give some throughout to be expected answer. He may prefer to even while the answer Answer should be specific and precise in language so that scope of the expected answer is clearly delimited.

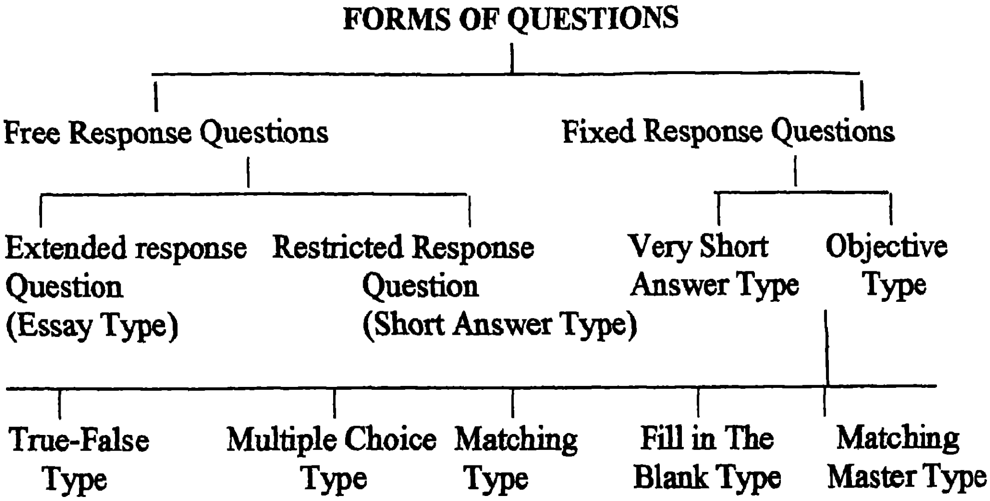
9. Key, Outline-Answer and Marketing Scheme:

In case of objective type questions key must prepared along with the question In case of essay type and short answer questions outline answers and the marking scheme should also be prepared weightage to each value point in terms of marks may also be mentioned

A setter, therefore, while constructing a question, should be conscious of the various dimensions of a question discussed above as also the other consideration peculiar to a particular form of the question.

3.3 DIFFERENT FORMS OF QUESTIONS:

The selection of different forms of questions depends upon the objective and content to test a particular learning outcome. Most commonly used system of evaluation is free response type of question. Essay type questions come under this category. In free response type there is also restriction under which short answer type questions comes. The other two different type (Very Short Answer and Objective Type) in which response is "Fixed" The various forms of question are usually classified as follows:



3.31 ESSAY TYPE QUESTIONS:

In this type the response in extended. There is no single response. Accuracy and quality is directly proportional to a content known to the person who is answering the question. These questions require the student to select relevant content, organize it coherently and express concisely in his own words relevant content, organize it coherently and express concisely in his own words:

Suggestion for constructing of essay question:

1. Essay questions should be set to test only those instructional objectives which are not amenable to testing by other forms
2. Each question should be based to test specific instructional objective or learning outcomes.
3. Language, scope and meaning should be clear. It should reflect specific content for a particular question.]
4. Directional words like, give an account, write short notes, what do you understand should be avoided

5. Maturation level of the examinees must be taken into consideration while constructing an essay question. Length and nature of answer will also differ from class to class.
6 Marks should be clearly allocated part-wise whenever there are more than one part in the same essay question.
7 Structure questions to guide on the scope and length of content on one hand and the style of the expected answer on the other.
8 A question should force examinees to sample a wider content in order to select organize and integrate information. This increases better coverage of course content and so increases reliability of the test.
9 Marking answers question – wise also increases reliability.
10 Prepare detailed marking scheme. All significant points should be mentioned with credit point-wise allocation of marks. Marking on specific credit points in-found to give a more reliable score than marking on the basis of over all impression with respect to a question
11 Reliability to essay type question can increase if student are trained to used improved type of questions as a model question.

3.32 SHORT ANSWER QUESTION:

The short answer questions may be regarded ad 'Mini Essay Type' as they are opened with a limited scope of ten answer. The answer is restricted to a few credit points (3 to 5 lines) They do not have fixed response but the accuracy and quality of a response; can easily be judged in reliable ad validity if appropriate marking scheme are prepared in advance. These questions require a student to select appropriate content adequately, organise it sequentially and express it with brevity.

Suggestion for construction of short answer questions:-

1. Short – Answer questions: if constructed properly, these can be used to test pupils achievement with desired reliability and validity. The scope of response should be usually 4 to 8 units. The directional words are also more carefully chosen e.g. "State four characteristics of, "Give four uses", Give four differences between."
2 Very Short Answer Questions: are often called fixed answer questions because in them the answer is more or less fixed by the item of the time of setting the question.

Suggestion for construction of very short answer questions:

1 The very short answer question are answered by a word, phrase, number or symbol
2 Both very short answer and completing items are essentially the same, differing only in the method of presenting the problem in the case of very short answer item
3 Scoring of very short answer items should be objective

3.33 OBJECTIVE TYPE QUESTION:

This type of questions are commonly used these days to measure the attainment of students and to provide the relevant information quickly This does not require subjective judgement in its scoring. The student has to select the correct answer from the number of alternative

The objective type of question can be set in different forms some of these forms are discussed below -

(a) True – False or alternative Response Type

In this type of question there is one choice and there is 50% chance for guess This type of question are usually written in the form of a declarative statements which the pupil is asked to mark true or false, yes or no

(b) Multiple Choice Type.

A multiple choice type consists of a problem and a list of suggested solutions The first part of this ty,type of question is called the stem which may be in the form of an incomplete sentence or interogative sentence or of several sentences according to the requirement The "Stem" supplies the data for the correct answer. The second part of the question consistsof alternatives where in one is the right response while other are just distractors.

Suggestions for constructing multiple choice items:

The construction of multiple choice test items involves the formulation of a clearly stated problem, the identification of plansible answers and special efforts to remove irrelevant clues to the answer. The following suggestions would be helpful for making effective use of this item form

1. Use Arabic numerals only, for numbering the items.
2. When stem is an incomplete statement start each alternative with a small matter and en it by a sign of full stop
3 Write all items with four alternative only.
4 Use A,B,C andD for numbering the alternative with no brackets.
5. The Correct answer should be among the alternative and it should be in random order
6 Give clear instruction if negative marking is to be made for wrong answer.
7. The stem of the item should be meaningful by itself and should prepare a single and definite problem
8 underline the words like NOT when used in the stem

(C) Fill in the Blank

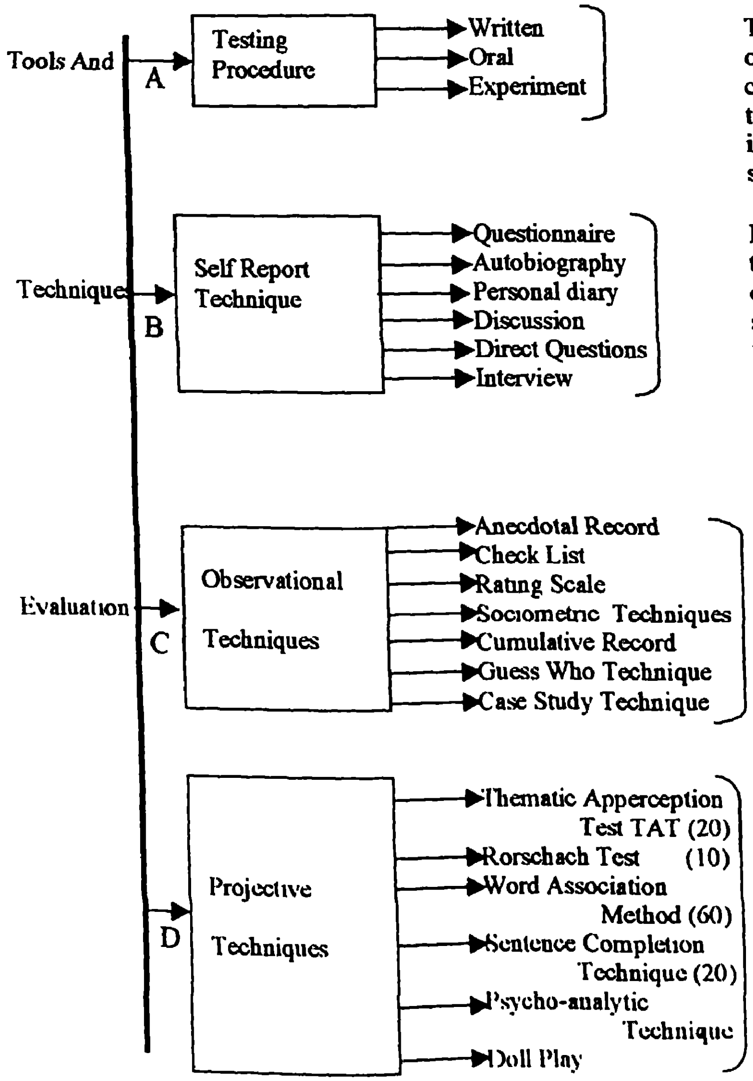
In fill of the blank type question some key word is always missing that space is left out They are similar to true or false type of question.

1 Statement of the question be proper and complete
2. Key words should be replaced by leaving blank space in the statement of the question.
3 Language should be clear and should test the specific ability of students.

Tools And Techniques of Evaluation

In the words of Kothari Commission (1964-66) "Evaluation is a continuous process It forms an integral part of the total system of education and is intimately related to educational objectives It exercises a great influence in the pupil's study habits and the teacher's methods of instruction and thus helps not only to measure educational achievement but also to improve it The techniques of evaluation are means of collecting evidences about the students development in desirable directions"

Evaluation process produces the data for cognitive, affective & psychomotor objectives There are many tools and techniques, which are used to evaluate the pupil's achievement and the objective of teaching For the complete assessment of the child's personality a battery of tests are required to be administered This may include Achievement tests Self-Report Techniques Observational Technique and Projective Techniques



These are quantitative techniques of evaluation used for evaluating cognitive objectives(achievement test). Can be used to evaluate interest. attitude and attitude of the students.

By collecting the information about the students, directly or indirectly, evaluation can be done, as each student keeps lots of information to himself Each student is in uniquely excellent position to give a view of himself to which no one else has an access.

These techniques are used for evaluating affective objectives and for internal assessment. These are Qualitative Techniques of evaluation

Complex aspect of the personality of the students and the facts related with his social adjustment can be evaluated by this method

A. 1 Written technique:

In this type, the written questions are asked and students have to write their answers The written tests are more effective than oral test. The written tests are usually of three types -

(i) Essay type (ii) Short answer type (iii) Objective type test

(i) Essay type tests are of many types They are worded differently by different examiners William D Hedges adapted the classification of essay type tests which are as follows -

(a) Who, what, when, which, whence, whom

(b) Define, state, repeat from memory, identify, quote, recite, designate, name

(c) List, enumerate, trace, arrange in order.

(d) Outline, organise, classify.

(e) Describe (an object), describe (a procedure), tell, write about, narrate

(f) Contrast, distinguish between, discriminate between, differentiate

(g) Compare, contrast, list similarities, list dissimilarities.

(h) Explain, show how, show why, give, explanatory reasons.

(i) Discuss, defend, refute, prove, disprove, justify.

(j) Develop, discuss as fully as possible.

(k) Summarize, integrate

(l) Evaluation, consider, judge interpret.

(ii) **Short answer type**

Each question measures a specific learning objectives. The emphasis is given on the coverage of learning objectives rather than content coverage. The word of the question has single meaning It can be classified on the basis of length of the expected answer.

(iii) **Different types of objective type tests are -**

(a) Recall type test

(b) Multiple type test

(c) Matching type test

(d) True false type test

(e) Completion type test

(f) Master list type

(g) Classification type test

A. 2 Oral technique of evaluation:-

These are used at lower level in organising and leading teaching activities

A. 3 Experimental technique:-

It involves **Internal Examination** and **External Examination**.

B. 1 Questionnaire

It refers to a deice for securing answers to the questions by using a form which the respondent fills himself

A questionnaire may contain two kinds of items

(a) The closed or structured form

(b) The open end or unstructured form

The closed form requires short and check responses. It may provide for making 'yes' or 'No' or just a 'check' from a list of suggested responses.

In the open end the respondent is at liberty to express his views, attitudes, interests, preferences and decisions in his own words. It can further be classified as (i) Questionnaire to be filled up by the parents (ii) Questionnaire to be filled up by the students.

B. 2 Autobiography

It is a subjective method. The student writes about his experience of life from the early childhood

Kinds of autobiography -

(a) Directed Autobiography

(b) Personal History

In the directed autobiography student is not free to write about himself It is like a questionnaire, according to which he has to write his autobiography

In personal history type, the student writes about himself which may or may not be systematically organised and in chronological order This technique encourages the students to read the autobiography of great men It relieves them from tension

B. 3 Personal diary

Students are directed to write there personal feelings about any event or their daily routine or anything they wish to write on their own It is of two types (i) Structured i e an outline in provided ii) unstructured i e students are free to write about anything

B. 4 Discussion

It can be formal or informal In the formal discussion, proper schedule is prepared, while free responses are sought in the informal discussion This technique may be used for evaluating problem solving attitude, creative ability and thinking among students. Higher order of cognitive and affective objectives can be tested by this method It can further be classified into two types – autocratic (by the teacher) and democratic by the students.

B. 5 Direct questions

Lots of information about the students can be collected by direct questions It deals with a significant topic/area. Each question deals with a single idea Items are arranged in categories to ensure easy and accurate responses. Clear instructions are provided in the beginning.

B. 6 Interview technique

The interview method of evaluation requires physical proximity of two or more persons and all the normal channels of communications are kept open between the two.

Interview enables the teacher to tackle his everyday class problems. It is very helpful in revealing the reasons for actions, feeling and attitudes of the subject under reference, as it is very reliable

Types of interview –

(i) According to function
    (a) diagnostic
    (b) treatment
    (c) research

(ii) According to number of participants
  (a) individual interview
  (b) group interview
  (c) single interviewer
  (d) panel interviewer

(iii) According to length of contact
  (a) short contact
  (b) prolonged contact

(iv) According to planning
  (a) structured
  (b) unstructured
  (c) eclectic

Points in interviewing -

(i) who is to interview – The interviewer must be clear in his mind of his strengths and weakness.

(ii) Whom - He should be understand his client thoroughly

(iii) How – He should know the technique

(iv) Why – He should be clear of the purpose of interview

(v) Where – Suitable place should be selected for this purpose

(vi) When – Proper motivation should be developed

(vii) What to able – He should prepare/plan his questions thought fully.

C. Observational technique

Observation deals with the overt behaviour of the students in appropriate situations. It is measurement without instrument. This technique is indispensable in school evaluation It is used at all the stages of education The classroom interaction can be evaluated only by the observation technique.

It should be done carefully, intelligently and scientifically as observation of behaviour has been recognised as basic to other techniques This technique can be used with students of all ages and it is very reliable and objective

Principles of a good observation

(i) Observe the whole situation

(ii) Select one student to observe at a time

(iii) Students should be observed in their regular activities, such as in classroom, in the laboratories, on the playground or in moving from one class to another class

(iv) Observation should be made over a period of day

(v) Observations should be recorded simultaneously to avoid dissolution

Requisites of a good observation

(i) Proper planning

(ii) Proper execution

(iii) Proper recording

(iv) Proper interppretation

C.1. Anecdotal record

This type of record maintains the description of significant event and work or performance of the student. The correct information is noted regarding the incidence and performance of the student in anecdotal record. The interest and learning of the students can be assessed with the help of such records. Such records can be used to provide the guidance to the students. To be most useful, anecdotal records of a pupil should be kept over as extended period of time. To retain a reliable sample of a child's behaviour and to make any useful assessment of changes that may occur, it is essential that an adequate number of anecdotes be made.

Summarizing and interpreting are usually best done by the teacher who has written the anecdotal record. It can be passed on to successive teachers as pupil progress.

Suggestions:

1. Anecdotal record is useful if written accurately. It should be written immediately after the incident
2. Description should be objective & free of biases.
3. Background of the incidence should be written.
4. Original record should be kept confidential.
5. Proper proforma and way of writing and summarizing it should be planned in the beginning of the session.

Sample form

Name of the student

Class

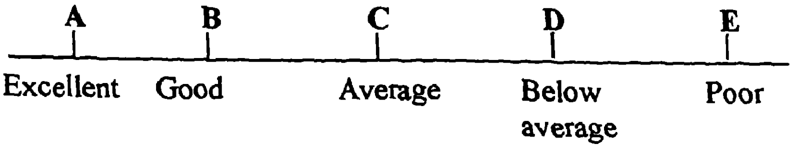
Date	Place	Incidence	Remarks

C.2. Check List: This technique is used for evaluating interest, attitudes and values of the students It is a type of questionnaire in the form of a set of items which the respondent is asked to check It is used in the appraisal of procedures and outcomes It is also used in observational studies of behaviour It systematizes the recording of responses. Items which are to be evaluated should be determined carefully and related items should be grouped together.

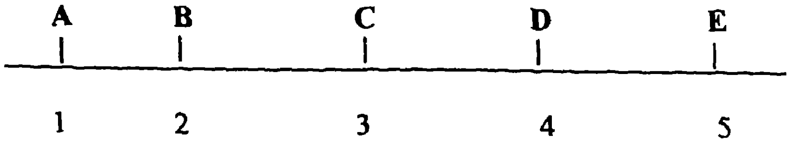
C.3 . Rating Scale: Rating is a term used to express an.opinion or judgement regarding some situation, object or character. These are expressed on a scale of values.

Types of Rating Scale –

1. **Descriptive**



2. **Numerical**



In this given cod number is given to each descriptive phrase arranged in order of superiority.

3. **Graphic**

Low moral Good moral High moral

-----|--------------|------------------|------------------|-------------------|--------------

0 25 50 75 100

To rate the subject for particular trait, a check mark is made at the particular point

Uses of Rating Scale-

(i) Helps in administration work

(ii) One trait is focused at a time

(iii) Motivates the person being rated

(iv) Helps in continuous comprehensive evaluation

(v) Easy to administer

Guidelines for construction

(i) Traits should be described objectively

(ii) A trait should refer to a single type of activity

(iii) Traits should be judged on the basis of past and present accomplishment

(iv) Only a significant trait should be judged

Errors to be avoided

(i) Error of leniency

(ii) Error of central tendency

(iii) Contrast error

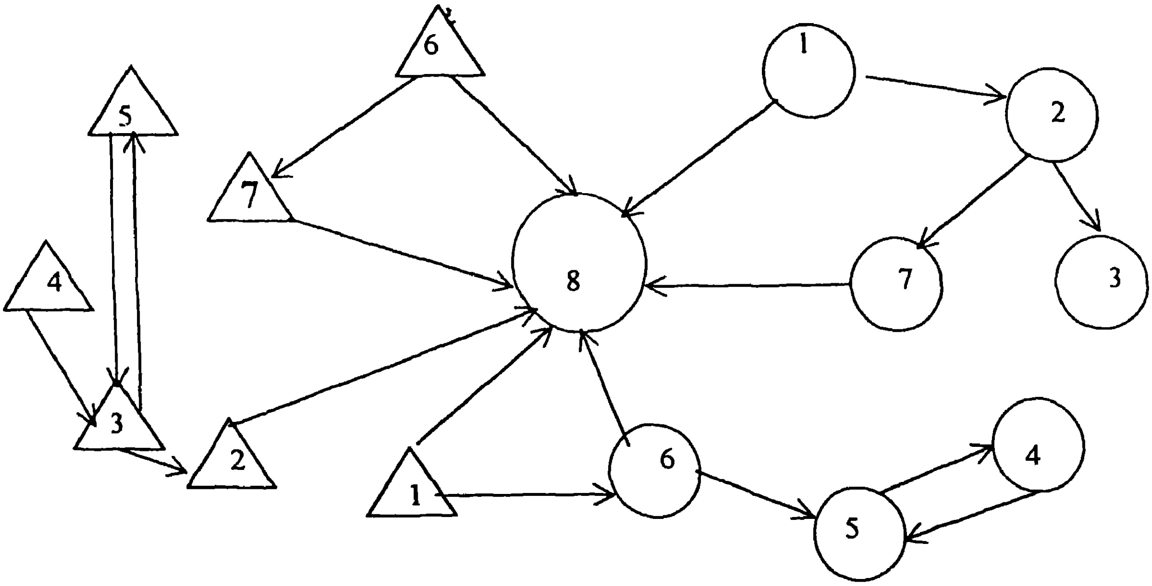
(iv) Halo effect

(v proximity error

C. 4. Sociometic technique

It is a pectorial or graphic representation of relationships of a specified nature among members of a group and is based on information gathered from members of the group. The students are asked to give their first, second and third preferences about one another and after counting the preference it can be found out who is well – adjusted in the group, who is most popular i.e. star, who is isolated i.e. having no preference. It provided a teacher with information that will help him to understand the behaviour of the group and to function more effectively in working with that group. It is important that appropriate action be takes soon after the sociogram has been completed and examined. If the teacher has asked pupils to tell with whom they would like to work, grouping should be formed on the basis of what the children have asked for, as far as is possible

Sociogram



A good technique to know the Social structure of a group.

Δ = boys; O = Girls

Girls no. 8 is centre of attraction and natural leader. Girl no. 3 and 4; boys no. 4 and 5 are isolates.

C.5. Cumulative Records

* It is a record of information concerned with appraisal of the individual – usually kept on a card – kept in one place.

* **Types** → Single
→ packet or folder
→ Cumulative Folder

Subject matter of cumulative record

1. Personal
2. Home and family environment
3 Attendance
4 Health
5 Assessment of ability
6. Interest
7 Hobbies
8. Personality traits
9. Academic work
10 Student's profession and plan for future education

11 Choice of profession and plan for future education

12 Co-curricular activities

13 Class – teacher remark

14 Principal's remark

Qualities of a good Cumulative Records

1 Complete and true information

2 Opinion of all the concerned teacher

3 Confidential and free from biasing

4. Re - evaluation

5. Objectivity

C. 6. Guess who Technique

In this method students are directed to tell the name of their classmates description of whom is done with word pictures. For example – "Here is a body who does anything to make others happy - - ----". "Here is a girl who is always late in the class ------ etc". In this way a popular student may be named several times while the unpopular students are associated with undesirable characteristics.

D.1. Thematic Apperception Test (TAT)

TAT consists of the twenty pictures including one blank card. The cards used depend upon the age and sex of the subject. The total number of cards used with one subject of a particular age and sex is twenty. The subject is told that the test is about imagination and there is no right or wrong response. The pictures are shown one by one and then the subject is asked (i) to tell what he thinks led up to the scene in the picture (ii) to give an account of what is happening and the feeling of characters in the picture (iii) to tell what the outcome will be Testing is followed by an inquiry in which the teacher clarifies meaning of stories and learn about their origins.

D. 2. Rorschach Test: Rorschach Ink-Blot Test is a well known example of projective technique of evaluation. It consists of a series of (ten) what purport to be inkblots, some black, some in colour. These are shown to the student, one at a time and he is asked to tell what they suggest or remind him of. From the student's responses, the teacher can determine much about the presence and nature of deep seated emotional conflicts and make adjustments which the student himself may no understand or even be conscious of Obviously, such a test requires much training and experience to administer and interpret

D. 3. Word association test

The procedure in this type of test is to present a list of words one at a time to the student, asking him to give the first word that comes to his mind in each case For example when a word 'mother is told, the subject may write 'love' 'affection', 'lady' etc Here 'mother' is stimulus word and the associated words are called reaction word Yung made a list of 60 words and divided reaction words into four categories i e (i) Ego centric (ii) Super ordinates (iii) Miscellaneous (iv) Speech habit

D. 4. Sentence Completion test

In this technique, students are asked to complete this sentences quickly, first few words of which are given by the teacher. Tendler in 1930 designed 20 sentences such as "I feel happy when --------". I tell a lie when --------etc.

This technique evaluates attitudes & desires of the subject.

D. 5. Psycho Analytic method

Student's aspirations, ambitions, hopes and anxieties can be identified by this method. The subject is allowed to acquire a relaxed position at a comfortable place and he is encouraged to speak anything that comes to his mind. Those ideas and thoughts might be incoherent, unorganized or absurd Psychoanalysts can pick up the mysteries conflicts unconscious desires, attitudes and problems of the personality of the subject and then he evaluates and treat him accordingly.

D. 6. Doll Play

The child when playing with the dolls is living in a make believe world. He imposes upon himself certains rules and regulations which are quite voluntary and come from within himself. His inner self is brought out by way of projection f his ideas to the play Thus, his though, aims and conflicts are revealed and those can be evaluated.

Projective techniques of evaluation is helpful in identifying problem children and the reason thereof and the cause of his underperformance in teaching learning programme.

CHAPTER - V

5.0 PLANNING A BETTER QUESTION PAPER

The present consensus seams to follow the definition of measurement as the assignment figment of number of objects or events according to rules. Educational measurement may be taken as finding the correspondence between two sets, one consisting of educational achievements and the other consisting of numerals. The correspondence may be established by direct observation or by observing the effect of students on some tools. A question paper is one such tool consisting of a number of situations to which students give their responses thereby helping the establishment of a correspondence with the set of numerals

The defect in the written tests of today might help in planning a good test the real guidance will have to be taken from the criteria of a good test which comprises the following:

A) Validity
B) Reliability
C) Objectivity
D) Practicability

Let us see how we can remove the defect in the present question papers and at the same time take care of the criteria of a good question paper

Sl.No.	**Short coming in the present question paper**	**Steps for removing the short counting**	**Resulting Criteria**
1.	Emphasis on Memory	1. Select objectives 2. Give desirable proportionate weightage them 3. Set question & Testing those objectives 4. Try to cover different specifications	Validity
2.	Inadequate Content Coverage	1. Divide the syllabus in Units 2. Give appropriate weightage to each Unit. 3. Eliminate over all options 4. Set questions based on these units 5. Have only internal option	1. Validity 2. Reliability
3	Mostly Essay Questions	1. Include different form of questions 2. Give appropriate weightage to them 3. Include more short answer of objectives type questions	1. Validity 2. Reliability 3. Objectivity
	Paper setter	1. Prepare a plan	1.Objectivity

5	Examiner's subjectivity	1. Word the question in a simple and clear language 2. Make the question specific and pointed 3. Make the scope of the answer clear.	Objectivity
6	Examiner's subjectivity	1. Introduce objectiv3e type questions 2. Prepare a marking scheme and scoring key	Objectivity
7	Malpractices arising out of changes	1. Give objective type questions in different Sections. 2. Give separate time limits for different sections	Practicals

5.1 MAJOR STEPS OF PLANNING A QUESTION PAPER

1. Preparing the design of the question paper
2. Preparing the blue print of the question paper
3. Writing question and assembling the question paper.
4. Preparing the key, out line answer and the marking scheme of the question paper.
5. Preparing the question wise analysis.
6. Editing the question paper.

5.2 PREPARING THE DESIGN OF A QUESTION PAPER

For public examination the design will be formed at the Board, but in case have to prepare it, for himself. The design of question paper given details of some basic requirements for setting a good question paper. If also mention certain policy decision are grading the various items discussed below.

5.2-1 WEIGHTAGE TO OBJECTIVES

For an evaluation programme to be comprehensive and valid it is essential that all the out course of instruction should be evaluated. But the objective in the affective domains are not early testable through the written examination. The paper setter must see to it that all the objectives testable through written examination get their due share and their respective weightage and based on national and social needs, nature of the subject and the level of the student they should also test as many specification under each objective they possibly can the distribution of marks to the objective which are a menuate to written text is given below·

S. No	Objectives	Marks	Percentage
1.	Knowledge		
2	Understanding		
3.	Application		
4.	Skill		
	Total	50	100

5.2-2 Weightage to content:

The paper setter has to take a decision about the weightages to be given to different topics or such topics of the subject depending upon their importance of the time spent in the class No. topic should, however, be completely ignored.

S No	Content	Marks	Percentage
1. 2 3. 4.			
	Total		

5.2-3 WEIGHTAGE TO FORMS OF QUESTION:

It has been agreed that a paper should not contain only routine essay type question but it should also contain short answer and objective type question. This helps better coverage of the syllabus.

Each essay type question required writing 2 to 3 pages.

Regarding short answer question it is considered that such questions may in bom as answer of one word to an answer not exceeding 8 to 10 times.
Objective type questions should include multiple choice type true and false or fill up the true type question weightage to the found of question:

S. No	Forms of question	No. of Question	Percentage	Estimated time in minute
1.	Essay Type			
2.	Short Answer type			
3.	Objective type			

Regarding the question wise distribution of marks, much will depend upto the difficulty level and thought process in holding in the question and the paper setter should consider himself free in respect of allotment of marks to different type of question. However, following are some suggestion in this regard.

Essay type questions may early 8 to 10 marks each short answer question may carry 20 to 3 marks each. Objective type question may carry ½ to 1 marks each.

5.2-4 LANGUAGE WORDING DIRECTIONS ETC.:

It is observed that many times the direction in the paper are composing and the wording of the questions non specific regarding the scope of the answer. It is therefore, suggested that the paper setter should be very careful in drafting the directions of the paper as a whole and those in each question. There should be clean indirection about the length of the answer of drawing a different message emerging from them.

5.2-5 DIFFICULTY LEVEL:

Difficulty level of question paper is governed by the difficulty level of individual questions Depending upto the purpose for which it is meant a question paper is set at a certain level of difficulty. Supporting it is designed to set a question paper for selection purposes then the difficulty level will have to be kept high. The question paper should include 15% essay, 70% average and 15% difficult questions.

5.2-6 SECTIONS:

When all the three types of questions are included in the question paper is desirable to part them in the sections one consisting of objective type and some short answer type question and the other of the essay and the short answer type question there section may have separate than a limit.

5.2-7 OPTIONS :

Care should be taken while giving internal option that the questions are of comparable difficulty and area on difficult aspects of the same or similar types. They should also cover as far as possible the some objective.

5.2-8 PREPARATION OF BLUE PRINT ~~OF THE~~ QUESTION PAPER:

When the weightage to difficult objective, content areas, and the favour questions have been decided and also the number of questions to be asked is settled, the paper setter has to decide how all the questions should be distributed over different objective and content area so as to have the weightage decide above.

This is generally done by measure of a three dimensional chart called the blue print taking content areas in horizontal rows and objectives and form of question in the vertical column. This like an architect blue print is very important areas it is ready, all that paper setter has to do in to select or frame items to fit into blue print.

5.2-9 WRITING QUESTIONS AND ASCENDING THE QUESTION PAPER:

After the design and the blue print of the question paper are ready the paper setter has to write question to fulfill the requirements of the blue print. He may sometime ever collects them form other sources such as a library of items if good objective based items of favour forms are available in such a library, while assembling question he has to see that individual question are based on the desired objective and counter area and the area of appropriate forms finally he has to get all the question as have been provided for in the blue print including options.

5.2-10 PREPARING THE SCORING KEY AND MARKING SCHEME OF QUESTION PAPER:

These are prepared in advance so as to avoid set pattern in the answer of objective type questions and avoid uncertainty in the answer of short answer type and essay type questions. This practice will also check the setting of questions answers to which are not define or clear, even to the setter A detailed scheme of marking will go a long way in ensuring greater objectivity and reliability of scoring

5.2-11 PREPARING THE QUESTION WISE ANALYSIS:

The summaries of allotment of marks to various objectives areas of content forms of questions difficulty level etc. and the time allotted to different question When checked against the blue print determine whether the paper set to specification or not

5.2-12 EDITING THE QUESTION PAPER

Editing the question paper is also very important. The setter must review the whole paper and find out if there are any cross of language, direction etc. He has to see that no question in the question paper gives clue to other question marks for every question have been indicated either in the instructions or in the right hand margin and multiple choice questions are properly written in the specified order etc All instructions should be adequate clear for the students.

Q No	Objectives	Specification	Content (Topic/ Subtopic)	Form of Question	Estimated Difficulty	Estimated Time in Minutes	Mark Allotted	Marks

E = Essay Type
S A = Short Answer
V S A = Very Short Answer
O = Objective type

A = Difficulty
B = Average
C = Easy

CHAPTER - VI

6.0 ANALYSIS OF QUESTION PAPER

1. Name of the Board
2. Name of the Examination
3. Year of Examination
4. Class
5. Subject
6. Paper
7 Maximum Marks
8 Time Allotted
9. Section
10. Scheme of Options

(I) Internal Option in essay question are given in _________ _____section

(II) There are ________ question set carrying ______ marks out of which ____________ questions are to be attempted carrying ___ ____________ marks in all.

11. The instruction for candidates are clear.

6.1 WEIGHTAGE TO OBJECTIVES

Weightage to objectives

Knowledge		%
Understanding		%
Application		%
Skill		%
Total	100	%

It is suggested that the following weightage to objective be adopted

Knowledge	50%
Understanding	25%
Application	15%
Skill	10%
Total	100%

6.2 Distribution of marks over different topics should be fairly satisfactory

6.3 Coverage of content

Topics are to be fair by well covered to the extent of over 90%

6.4 The weightage to forms of the question:

Essay = 30%
Short Answer = 45%
Objective Type = 25%
Total = 100%

6.5 Definiteness of Questions

6.6 Difficulty Level

6.7 Comparability of Options.

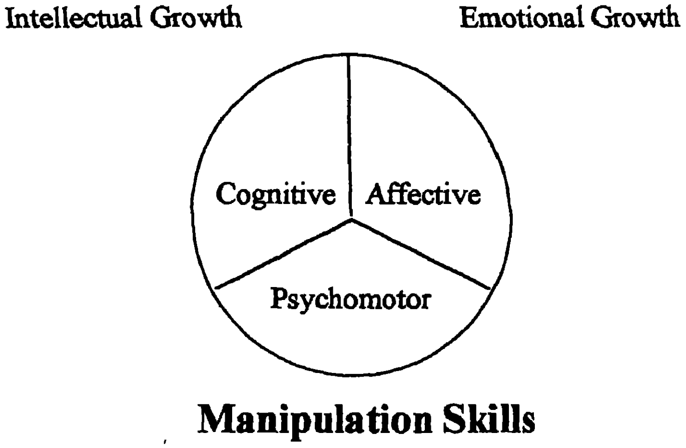
CHAPTER – VII

EVALUATION IN CO – SCHOLASTIC AREA

7.0 INTRODUCTION

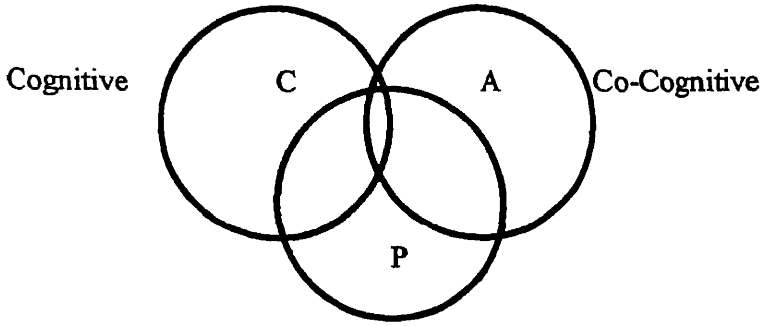
It is a matter of great concern that educational systems of most of the countries failed to see the totality of the development and completely ignoring the affective and emotional development of the students. The absence of satisfactory co-scholastic growth in students in a fall – out of legacy of the educational system of preceding century. This paved a way for structuring a violent, and in-cohesive society full of difficulties, crisis and tensions.

Generally, three domains, namely, cognitive, affective and psychomotor are considered to be the components of total personality. Cognitive symbolises intellectual skills and knowledge, affective encompanes characteristics such as social – personal qualities, interests, attitudes and values. The psychomotor domain deals with the manipulative skills generally used for vocational success. The following pie-chart shows the different dimensions of personality growth where from a number of personality traits can be delineated.



All Round Development

Personality has been defined by scholars as a set of cognitive and co-cognitive traits (Ebel and Frisbie, 1979). This set includes elements of intellect, achievement, values, attitudes, appearance and so on. These are also classified as scholastic (cognitive) and co-scholastic (non-cognitive or co-cognitive) areas, Scholastic stands for intellectual development and co-scholastic for other affective and psychomotor areas. The following Venn diagram shows a rough distinction between cognitive and co-cognitive aspects representing them in shaded and un-shaded regions:



It is clear from the above diagrams that there is a slight overlapping on the affective dimension from cognitive and psychomotor areas. It is because no learning can take place in the absence of cognition. Therefore, the co-scholastic area does keep a certain amount of cognition in it, whereas the whole of affective and psychomotor domains constitute co-cognitive area excluding that part of affective and psychomotor domains.

Although various commissions and committees have stressed on the responsibility of the schools to develop co-cognitive characteristics of students alongwith scholastic potentials, yet by and large, schools lay emphasis on cognitive domain in the educational process for the child and believe that affective areas do not contribute much towards academic success.

The learning in co-scholastic area is not only helpful for living a quality life but has direct relevance to the ability to learn, interest in learning and value education.

7.1 ISSUES IN ASSESSING CO-SCHOLASTIC LEARNING OUTCOMES

1. Unlike cognitive outcomes, affective qualities do not lend themselves to be effectively assessed through paper pencil tests. The teachers will have to depend greatly on personal observation of student behaviour and infer about the satisfactory development of the qualities. Teachers need to be properly oriented to carry out such observations.

2. Co-scholastic outcomes are not as tangible as cognitive outcomes are.. This lays a high premium on the capability of the evaluators that the evaluation of students is not influenced by their own personal preferences and prejudices.

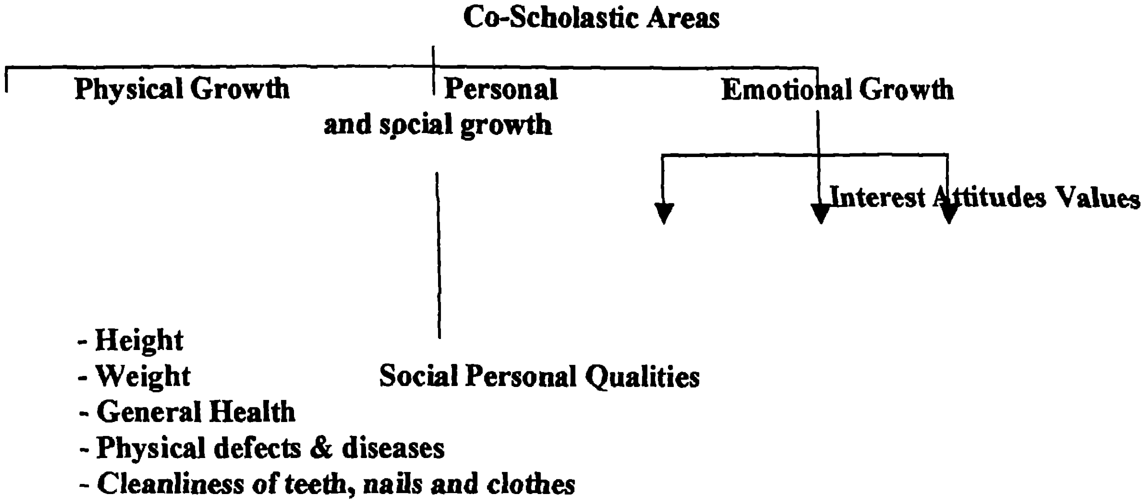
3. Co-scholastic outcomes can at no stage be considered as fully developed. They have always to be seen in terms of 'degree of satisfaction' by the evaluator with respect to the manifestation of different qualities in due behaviour of the students.

4. The overt behaviour observed by the teacher is functional and contextual, and can at times, be misleading.

5. It is essential that evaluation of co-scholastic aspects is a periodic and continuous affairs one time observations and references can lead to wrong judgement of students.

7.2 SPECIFICALLY WHAT TO ASSESS AND HOW ?

To begin with, it is necessary to identify and to focus upon the qualities under co-scholastic areas to be tested. A chart indicating the scope of co-scholastic area is given below:


Co-Scholastic Areas
Physical Growth
Personal and social growth
Emotional Growth
Interest
Attitudes
Values
- Height
- Weight
- General Health
- Physical defects & diseases
- Cleanliness of teeth, nails and clothes
Social Personal Qualities

The above chart is relevant to the understanding of the question as what is to be tested in co-scholastic area.

After identifying qualities, specifications of behaviour indicators e.g. helps others in need (social growth) required for the purpose of assessment in each growth area. Identification of qualities and defining of behaviour indicators are followed by gathering information requires different sources such as the child himself, other Children, parents, other teachers, other adults etc. The observation of these persons should be made in various setting with a purpose.

The next step is recording of data. The gathered information has to be recorded systematically some procedure for doing this are as under: ·

	Description	**Count or Tally**	**Record of Impressions**
1.	**Normative**	**Check List**	**Rating Scale**
2.	**Records**	**Participation Chart**	**Teacher Diary**
3.	**Anecdotes**		
4.	**Sorting**	**Frequency Chart**	

Gathering and recording information leads to analysis of data and making judgement. This judgement may be graded on 2 or three point scale. It may be mentioned that scoring of these behaviours is not advisable at all. The method of direct grading may be used. Reporting depends on grading. In fact reporting is the last step of the assessment procedure. Generally it is observed that school report cards lack columns for the reporting of co-cognitive areas. Schools should get new cards made having enough space for both scholastic and co-scholastic areas.

CHAPTER VIII

8.0

SAMPLE PAPERS

PHYSICS - CLASS XII

DESIGN OF THE QUESTION PAPER

Time : 3Hrs Max.Marks:70

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows

1. **Weightage to learning outcomes**

S No	Objective	Marks	Percentage of marks
1	Knowledge	20	29%
2	Understanding	30	42%
3	Application	20	29%
	Total	70	100

2. **Weightage to content /subject units**

Unitwise weightage

Unit No.	Name of the Unit	Marks
1	Electrostatics	8
2.	Current Electricity	7
3	Thermal and Chemical Effects of Current	8
4.	Magnetic Effect of Current	
5	Magnetism	4
6	Electromagnetic Induction and Alternating Current	8
7	Electromagnetic Waves	7
8	Wave Optics	
9	Ray Optics and optical instruments	7
10	Electrons & Photons	10
11	Atoms, Molecules and Nuclei	
12	Solids and Semiconductor Devices	8
13	Universe	3

3. Weightage to form of questions

S No	Form of Questions	Marks for each question	No of questions	Total Marks	Percentage
1	Long Answer Type Qs	5	3	15	21.4
2	Short Ans Qs I	3	9	27	38.5
3	Short Ans.Qs II.	2	10	20	28.6
4	V Short Answer Qs	1	8	8	11.5
	Total	-	30	70	100

Note : Although the weightage to different content areas and forms of questions has been assigned and the paper setters will adhere to the weightage but there can be slight variation in distribution of marks over different units/forms of questions in the board examination depending upon the situation

Note : The expected length of answers and time taken under different forms of questions would be as follows

S.No.	Form of Questions	Approximate Length	Expected Time for each question
1.	Long Answer type (LA)	120-150 words	12 minutes
2.	Long Answer Type (SA)I/II	40-50 words	8minutes/4minutes
3.	Very Short Answer	one or two sentences	2 minutes

This is only an approximation. Though students are advised to be as near the approximation as possible, the actual length may however, vary. As the total time is calculated on the basis of the number of questions required to be answered and the lengths of their anticipated answers, it would therefore, be advisable for the candidates to budget their time properly by avoiding unnecessary details.

4. Scheme of Options

(1) There will be no overall option

(2) Internal choices (either or type) on a very selective basis may be given in only one long answer question testing higher mental abilities.

(3) The alternative question given by way of choice would be based on the same objective and the same unit It would have the same anticipated difficulty level and length of answer.

5. Weightage to difficulty level of questions

S.No	Estimated difficulty level	Percentage
1	Easy	20%
2.	Average	60%
3	Difficult	20%

A question may vary in difficulty level from individual to individual. As such the approximation in respect of each question will be made by the paper setter on the basis of general expectation from the group as a whole This provision is only to make the paper balanced in nature rather than to determine the pattern of marking at any stage.

BLUE PRINT

Class : XII
Time : 3Hrs

Subject : Physics
Paper : Theory

Maximum Marks: 70

Sl NO	Objective From of Questions Units / Sub Units	Knowledge LA (5)	Knowledge SA (3)	Knowledge SA (2)	Knowledge VSA (1)	Understanding LA (5)	Understanding SA (3)	Understanding SA1 (2)	Understanding VSA (1)	Application LA (5)	Application SA (3)	Application SA (2)	Application VSA (1)	Skill LA (5)	Skill SA (3)	Skill SA (2)	Total
1	Electrostatics	-	-	-	-	5(1)	-	-	1(1)	-	-	2(1)	-	-	-	-	[illegible](3)
2	Current Electricity	-	3(1)	-	-	-	-	2(1)	-	-	-	2(1)	-	-	-	-	7(3)
3	Thermal Chemical & magnetic effects of current	-	-	-	-	-	3(1)	-	1(1)	-	3(1)	-	1(1)	-	-	-	8(4)
4	Magnetism	-	-	-	-	-	-	2(1)	-	-	-	2(1)	-	-	-	-	4(2)
5	Electromagnetic Ind & alternating current	5(1)	-	-	-	-	-	-	1(1)	-	-	2(1)	-	-	-	-	8(3)
6	E M waves & wave optics	-	3(1)	-	-	-	-	-	1(1)	-	3(1)	-	-	-	-	-	7(3)
7	Ray optics& Optical Instruments	-	-	2(1)	-	-	3(1)	-	-	-	-	2(1)	-	-	-	-	7(3)
8	Electrons Photons Atoms Molecule and Nuclei	-	-	-	1(1)	5(1)	-	2(1)	-	-	-	2(1)	-	-	-	-	10(4)
9	Solids & Semi Conductor devices	-	3(1)	-	-	-	3(1)	-	1(1)	-	-	-	1(1)	-	-	-	8(4)
10	Universe	-	3(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	3(1)
	Sub Total	5(1)	12(4)	2(1)	1(1)	10(2)	9(3)	6(3)	5(5)	-	6(2)	12(6)	2(2)	-	-	-	-
	Total	20(7)				30(13)				20(10)				-			70(30)

Note : Figures within brackets indicate the number of questions and figures outside the brackets indicate marks
• Denotes [illegible] marks have been combined to from one question

Summary

Long Answer (LA) or Essay (E)	No 3	Marks 15	Scheme of Options	Internal options only
Short Answer (SA) I	No 9	Marks 27	Scheme of Sections .	Nil
Short Answer (SA) II	No 10	Marks 20	Difficulty Level	Difficult 20% Average 60% Easy 20%
Very Short Answer (VSA) II	No 8	Marks 8		

PHYSICS

SAMPLE PAPER I

Time : 3 Hrs **Maximum Marks : 70**

General Instructions :

I All questions are compulsory.

II Marks for each question are indicated against it.

III Question numbers 1 to 8 are very short-answer questions. carrying 1 mark each These are to be answered in one or two sentences

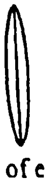
IV Question numbers 9 to 18 are short- answer questions, each carrying 2 marks Answer to these questions should be around 30 words each

V Question numbers 19 to 27 are also short-answer questions. carrying 3 marks. Answer to to these questions should be around 50, words each.

VI Question numbers 28 to 30 are long -answer questions, each carrying 5 marks each. Answer these should be around 150 words each.

VII Use log tables, if necessary.

1. What is the role of MnO_2 in a dry cell ? 1
2. Define one lumen? 1
3. A wire of resistivity ρ is stretched to three times its length. What will be its new resistivity? 1
4. An electron, moving with a velocity of 10^7 ms^{-1} enters a uniform magnetic field of 1 T along a direction parallel to the field. What would be its trajectory in this field? 1
5. How does the resolving power of a telescope change when the aperture of its objective is increased? 1
6. Suppose there existed a planet that went around the sun twice as fast as the earth. Will its orbital radius be more than or less than that of the earth? 1
7. An electric lamp connected in series with a capacitor and an a.c source is glowing with certain brightness. How does the brightness of the lamp change on reducing the capacitance? 1
8. An equiconvex lens of focal lenght 15 cm is cut into two equal halves as shown.



What is the focal length of each half? 1

9. What is meant by 'red shift'? What does it tell us about the universe ? 2
10. What is the name given to the curves, the tangent to which at any point gives the direction of the magnetic field at that point ? Can two such curves intersect each other? Justify your answer. 2

11. Write two points of difference between interference and diffraction patterns of light 2

12 Calculate the refractive index of the material of an equilateral prism for which the angle of minimum deviation is 60^0 2

13 If a 'compass box' and a 'dip circle' were to be taken to the magnetic north pole of the earth, what would one observe with regard to the deflections of their respective needles and why? 2

14. A circular brass loop of radius 'a' and resistance R is placed with its plane perpendicular to a magnetic field which varies with time as $B= B_0 \sin \omega t$ Obtain the expression for the induced current in the loop. 2

15 How would the following be affected in the absence of atmosphere around the earth?

a) Average surface temperature of earth

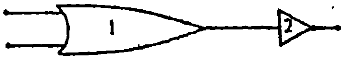
b) Range of radio waves transmission.

Give brief reasons for your answer in each case. 2

16. A microscope is focussed on a dot at the bottom of a beaker. Some oil is poured into the beaker to height of y cm and it is found necessary to raise the microscope through a vertical distance of x cm to bring the dot again into focus. Express refractive index of oil in terms of x and y. 2.

17. The energy of an electron in the nth orbit is given by $E_n = -13.6/n^2$ eV. Calculate the energy required to take an electron from ground state to the second excited state. 2

18. Identify the logic gates 1 and 2 in the logic circuit given below. Also write the truth table for the final output for all possible combinations of the inputs at A and B. 2



19. With the help of a circuit diagram, explain how would you compare the emfs of two primary cells using a potentiometer. 3

20. What is rectification? With the help of a labelled circuit diagram, explain full wave rectification using junction diodes. 3

21. Two capacitors of capacitances $C_1 = 3$ μf and $C_2 = 6$ μf arranged in series are connected in parallel with a third capacitor $C_3 = 4$ μf. The arrangement is connected to a 6.0 V battery. Calculate the total energy stored in the capacitors. 3

22 A series of battery of 10 lead accumulators each of emf 2 V and internal resistance of 0.25 ohm' is charged by 220 V D.C source . To limit the charging current a resistance of 47.5 ohm is used in series in the charging circuit. What is (a) the power supplied by the D.C. source and (b) power dissipated as heat ? Account for the difference or power in (a) and (b) 3

23 Describe an experiment to demonstrate transverse wave nature of light 3

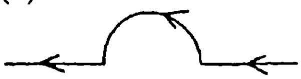
24 Draw the curve showing variations in binding energy per nucleon with mass number Explain the release of energy in the process of nuclear fission and fusion on the basis of the curve. 3

25 With the proper circuit diagram, show the biasing of a NPN transistor.

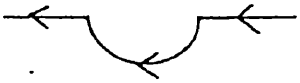
Explain the movement of charge carriers through different parts of this transistor Hence show that $I_e = I_b + I_c$ 3

26 A galvanometer coil has a resistance of 30 ohm and the meter shows full scale deflection for a current of 2.0 mA. Calculate the value of resistance required to convert it into an ammeter of 2 0 mA Also calculate the net resistance of the ammeter 3

27 A thick straight copper wire. carrying a current of 10 A is bent into a semicircular arc of radius 7.0 cm in figure (a) State the direction and calculate the magnitude of magnetic field at the centre of the arc. How would your answer change if the same wire were bent into a semicircular arc of the same radius but in opposite way as shown in figure (b)? 3



(a)



(b)

28. Define the terms electric dipole and dipole moment. Derive an expression for the electric field at a point of equitorial line of dipole.

OR

With the help of a labelled diagram, explain the working of a Van De Graaff generator. Mention its use. 5

29. What is photoelectric effect? Give any two piactical applications of this effect. Write Einstein's photoelectric equation and use it to explain the

(1) independence of maximum energy of the emitted photoelectrons from intensity of incident light.

(2) existence of a threshold frequency for a given photosensitive surface.

30. An LC circuit contains a 20 mH inductor and a 50 μF capacitor with an initial charge of 10 mC. The resistance of the circuit is negligible. Assume the instant when circuit is closed to be t = 0.

(a) What is the total energy stored initially?

(b) What is the frequency and time period of the LC oscillations?

(c) At what time is the energy stored

(i) completely electrical (i.e. stored in the capacitor)?

(ii) completely magnetic (i.e. stored in the inductor)?

Physical Constants

$1/4\pi\epsilon_0$	=	9×10^9 N m^2C^{-2}
c	=	3×10^8 ms^{-1}
h	=	6.6×10^{-34} Js
e	=	1.6×10^{-19} C
g	=	9.8 ms^{-2}
1amu	=	931 Mev

MARKING SCHEME

SAMPLE PAPER I

Q.No	Value Points	Marks	Total
1	It acts as a depolariser	1	1
2	Definition of Lumen	1	1
3	It will remain unchanged	1	1
4	Straight line	1	1
5	Increase with increase in aperture	1	1
6	Less than that of the earth	1	1
7	On reducing the capacitance		
	the brightness will decrease	1	1
8	30 cm	1	1
9.	(i) Definition of red shift	1	2
	(ii) Universe is expanding	1	
10.	(i) Line of magnetic field	½	
	(ii) No.	½	
	(iii) Justification	1	2
11.	(i) Difference w.r.t change in intensity of maximas	1	
12.	$\mu = \sin[(A+D_m)/2] / \sin(A/2)$	½	
	$A = 60^0$	½	
	Calculation		
	$\mu = 1.732$	1	2
13.	(i) The compass needle rests in any direction,	½+½	
	Reason Horizontal component of the earth's magnetic field is zero		
	(ii) The dip needle orients itself in such a way that its axis becomes verticle		
	Reason - Dip angle is 90^0	½ + ½	2
14	(i) $\phi = BA = \pi a^2 B_0 \sin \omega t$	½	
	(ii) $E = -(d\phi/dt)$	½	
	$= -\pi a^2 \omega B_0 \cos \omega t$	½	
	(iii) $i = E/R = -(\pi a^2 \omega B_0 \cos\omega t)/R$	½	

15	(i) Surface temperature will decrease	½	
	(ii) Range will decrease	½	2
	(iii) Reasoning for each	½+½	
16	(i) R I = Real depth /Apparent depth	½	
	(ii) Real depth = y	½	
	apparent depth = y-x	½	
	(iii) $\mu = y/(y-x)$	½	
17	(i) Calculation of E_1= -13.6 ev	½	
	(ii) Calculation of E_3= -1.51 ev	½	
	(iii) Calculation of E_3-E_1	1	2
	=12.09 ev		
18	(i) 1 - OR gate	½+½	
	2 - NOT gate		
	(ii) Truth table is	1	

Inputs		Outputs
A	B	Y
0	0	1
1	0	0
0	1	0
1	1	0

19.	(i) Circuit diagram	1	
	(ii) explanation and derivation of the equation $E_1/E_2 = l_1/l_2$	1+1	3
20.	(i) Definition of rectification	½	3
	(ii) Labelled circuit diagram	1	
	(iii) Explanation of rectification process with input an output wave forms	1½	
21	(i) $1/C' = 1/C_1 + 1/C_2 \Rightarrow C' = 2\mu f$	1	
	(ii) $C = C' + C_3 = 2 + 4 = 6\ \mu f$	1	3
	(iii) $E = 1/2\ CV^2 = 1.08\times10^{-4}J$	1	
22	(i) emf of the battery = 10 x 2 =20V	½	
	(ii) internal resistance=2.5 ohm	½	
	(iii) Charging current = 4A	½	

	(iv) Power Supplied by the mains=880W	½	
	(v) Power dissipated as heat = 800W	½	
	(vi) 880-800 = 80 W is stored in the battery in the form of chemical energy	½	
23	(i) Experimental set up with polaroids showing two differnet orientations of analyser (with diagram)	1	
	(ii) Explanation leading to polarization of light and hence transverse nature of light	2	3
24	(i) Drawing of curve	1	
	(ii) Explanation about increase in BE/nucleon during fission	1	3
	(iii) Explanation about increase in BE/nucleon during fusion		
25.	(i) Biasing of n-p-n transistor	1	
	(ii) Description of movement of charge carriers through emitter, base and collector	1	3
	(iii) Proof of $I_e=I_b+I_c$	1	
26.	(i) $I_s=I-I_g=0.988$A		1
	(ii) Voltage across shunt = voltage across the meter	½	
	$R_g I_g = S \times I_s$		
	$30\times2\times10^{-3}= S \times 0.988$		
	$S=6\times10^{-2}$ ohm	½	3
	(iii) $\frac{1}{R} = \frac{1}{R_g} + \frac{1}{R_s}$	½	
	$\Rightarrow R \cong 0.06$ ohm		
27	(a)(i) $B=\mu_0 I/4r$	½	
	(ii) Magnitude of $B=4.5\times10$ [illegible]T	1	
	(iii) Direction- Normal to the plane of the paper emerging out of it	½	
	(b) (iv) Same magnitude of B as in (a)	½	
	(v) Direction- oppsoite to that in (a)	½	3

28	(i) Definition of dipole	1	
	(ii) Definition of dipole moment	1	5
	(iii) Figure	1	
	(iv) Derivation of the expression $E = \dfrac{-\bar{p}}{4\pi\varepsilon_0\left(r^2 + \dfrac{a^2}{4}\right)^{3/2}}$	2	
	OR		
	(i) Labelled Diagram	2	
	(ii) Working	2	5
	(iii) Use	1	
29	(i) Statement	1	
	(ii) Two applications	1	
	(iii) $E_k = h\,(\mu-\mu_0)$	1	
	Explanation	2	
30.	(a) (i) Initial total energy = $Q_0^2/2C=1.0J$	½	
	(b) (i) $\vartheta = \dfrac{1}{2\pi\sqrt{LC}}$	½+½	
	(ii) Time period $T = 1/v$	½	5
	=6.3mS	½+½	
	(c) (i) Energy stored is completely electrical at $t = 0, T/2, T, 3T/2$	1	
	(ii) energy stored is completely magnetic at $t = T/4, 3T/4, 5T/4$	1	

QUESTION-WISE ANALYSIS

Subject : Physics **Paper** : Theory
Class : XII **M.M.**: 70;**Time**: 3Hours

Q No	Objective	Specification	unit/sub-unit	Form of Question	Marks Allotted	Estimated Time (minutes)	Estimated Difficulty Level
1	K	Recalls	Effects of current	VSA	1	2minutes	C
2	K	Recalls	Ray Optics	VSA	1	"	C
3	U	Calculates	Current Electricity	VSA	1	"	B
4	U	Differentiates	Magnetic Effect of Current	VSA	1	"	B
5	U	Gives Reason	Ray Optics	VSA	1	"	B
6	U	Explains	Universe	VSA	1	"	A
7	A	Analyses	Electromagnetic Induction	VSA	1	"	A
8.	A	Analyses	Ray Optics	VSA	1	"	C
9.	K	Recalls	Universe	SA-II	2	4 minutes	B
10.	U	Explains	Magnetism	SA-II	2	4 Minutes	B
11.	U	Differentiates	E.M. Waves & Wave Optics	SA-II	2	"	B
12.	U	Calculates	Ray Optics	SA-II	2	"	A
13.	A	Analyses	Magnetism	SA-II	2	"	A
14.	A	Analyses	A.C&Electromagnetic Induction	SA-II	2	"	A
15.	A	Analyses	E.M. Waves & Wave Optics	SA-II	2	"	B
16.	A	Analyses	Ray Optics	SA-II	2	"	B
17	A	Solves	Electron, Photon atoms	SA-II	2	"	B
18	A	Analyses	Solids & semiconductors	SA-II	2	"	B
19	K	Recalls	Current Electricity	SA-I	3	8 minutes	B
20	K	Recalls	Solids & semiconductors	SA-I	3	8	B

Note : Use abbreviations as follows :

(a) For Objectives K = Knowledge, U = Understanding, A = Application S = Skill

(b) For Form of questions VSA = very short answer, SA = Short Answer, LA=Long Answer

(c) A = Difficult, B = Average, C=Easy

Sample Paper-1

QUESTION-WISE ANALYSIS

Subject : Physics
Class : XII

Paper : Theory
M.M.: 70;Time: 3Hours

Q No	Objective	Specification	unit/sub-unit	Form of Question	Marks Allotted	Estimated Time (minutes)	Estimated Difficulty Level
21	U	Calculates	Electrostatics	SA-I	3	8minutes	B
22	U	Calculates	Ther &Chem effects	SA-I	3	8"	B
23	U	Explains	E M Waves & Wave Optics	SA-I	3	8"	B
24	U	Explains	Electrons,Photons Atoms &Nuclei	SA-I	3	8"	B
25	U+S	Draws & Explains	Solids & semi conductor Devices	SA-I	3	8"	B
26.	A	Calculates	Current electricity	SA-I	3	8"	A
27.	A	Calculates	Magnetic Effects of Current	SA-I	3	8"	A
28.	K	Recalls	Electrostatics	LA	5	12minutes	C
29.	K	Recalls	Electron,Photon etc.	LA	5	12"	C
30.	U	Calculates	Electron,Photon etc.	LA	5	12"	B

Note : Use abbreviations as follows :

(a) For Objectives : K = Knowledge, U = Understanding, A = Application, S = Skill

(b) For Form of questions VSA = very short answer, SA = Short Answer, LA=Long Answer

(c) A = Difficult, B = Average, C=Easy

8.1

SAMPLE QUESTIONS PAPERS

BIOLOGY – CLASS XII

DESIGN OF THE QUESTIONS PAPER

Time 3 Hours Max Marks 70

1. Weightage of objectives

Objective	K	U	A	S	Total
Percentage	29	43	21	7	100
Marks	20	30	15	5	70

2. Weightage to Form of Questions

Forms of Questions	LA	SA-I	SA-II	VSA	Total
No of questions	3	9	10	8 (5MC*)	30
Marks for each question	5	3	2	1	
Marks Allotted	15	27	20	8	70
Estimated Time (Mts)	36	72	40	12	(160+20 = 3 Hours)
Range of words	80-120	30-60	20-30	1-20	

* One Multiple Choice Question (MCQ) from each of the five content units

3. Weightage to Content Units

		Marks
1.	Multicellularity : Plant structure and function	13
2.	Multicellularity : Animal structure and function	17
3.	Continuity of life	17
4.	Origin and Evolution of Life	08
5	Applications of Biology	15

4. Scheme of Section : 4 Sections of five different forms of questions

5. Scheme of Options : Internal Choice

(i) SA I Skill based 1 Question 3 Marks
(ii) LA 2 Questions 5 marks each

6. Difficulty Level :

Difficult	(A)	15% Marks
Average	(B)	70% Marks
Easy	(C)	15% Marks

Abbreviations K (Knowledge), U (Understanding), A (Application), S (Skill), SA (Short Answer Type), VSA (Very Short Answer Type), LA (Long Answer Type)

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SAMPLE PAPER - I

Class · XII

Time 3 hrs.

Subject . Biology

Maximum Marks : 70

Unit/Paper Theory

S No	Objectives	Knowlege				Understanding				Application				Skill			Total
	Form of Questions Unit/Sub Units	LA	SA-I	SA-II	VSA	LA	SA-I	SA-II	VSA	LA	SA-I	SA-II	VSA	LA	SA-I	SA-II	
1	Multicellularity Plant Structure and functions	3(1)* 28	-	-	-	-	3(1) 22	-	1(1) 7	-	3(1) 24	-	1(1)* 3	2*	-	-	13(5)
2	Multicellularity Animal structure and function	-	-	2(1) 9	1(1)* 1	5(1) 29	-	2(1) 13	-	-	3(1) 25	-	1(1) 8	-	3(1) 27	-	17(7)
3	Continuity of life	-	3(1) 20	-	1(1)* 2	5(1) 30	-	2(3) 12, 14, 16	-	-	-	2(1) 17	-	-	-	-	17(7)
4	Origin and Evolution of Life	-	3(1) 21	2(1) 10	-	-	-	-	1(1)* 5	-	-	2(1) 18	-	-	-	-	8(4)
5	Applications of Biology	-	3(1) 19	2(1) 11	-	-	3(1) 23	2(1) 15	1(2) 6, 4*	-	3(1) 26	-	-	-	-	-	15(7)
	SUB TOTAL	3(1)	9(3)	6(3)	2(2)	10(2)	6(2)	10(5)	4(4)	-	9(3)	4(2)	2(2)	2	3(1)		70(30)
	TOTAL	20(9)				30(13)				15(7)				5(1)			

Notes · Figures within brackets indicate the number of questions and figures outside the brackets indicate marks The figure mentioned under brackets indicate the question number

- Denote that marks have been combined to form one question
- Idicates Multiple Choice Questions

Summary			
(1-5) MCQ (4 options)	No 5 Marks 5	Scheme of Options	Internal Choice
(6-8) Very short answer (VSA)	No 3 Marks 3	(i) SA I Skill base	1 Question 3 Marks
(9-18) Short Answer (S A) II	No 10 Marks 20	(ii) LA	2 Questions 5 Marks
(19-27) Short Answer (S A) I	No 9 Marks 27	Scheme of Sections	Four Sections of different forms of questions
(28-30) Short Answer (L A) II	No 3 Marks 15	Difficulty Level	A 15%, B - 70%, C 15%.

SAMPLE PAPER I

BIOLOGY (THEORY)

CLASS XII

Time Allowed 3 Hours *Maximum Marks 70*

(i) This question paper consists of four Sections A, B, C and D Section A contains 8 questions of 1 mark each. Section B is of 10 questions of 2 marks each Section C is of 9 questions of 3 marks each and Section D is of 3 questions of 5 marks each

(ii) All questions in Section A and B are compulsory In sections C and D internal choice has been provided in question Nos 27.29 and 30

SECTION – A

Q Nos 1-8 are of very short answer type carrying 1 mark each. Of these the first five questions are of multiple choice type which have to be answered simply as A, B, C or D The remaining questions have to be answered in approximately 1-20 words each

1. Which one of the following nerves carries both sensory and motor fibres?

   (A) Optic

   (B) Vagus

   (C) Auditory

   (D) Trochlear

2. The condition known as sickle cell anaemia is caused due to

   (A) chromosomal mutation

   (B) silent Mutation

   (C) frameshift mutation

   (D) point mutation

3. A potted plant has been supplied with water containing high quality of common salt As a result the cells of the root will be found to be

   (A) plasmolysed

   (B) deplasmolysed

   (C) turgid

   (D) crenated

4. In which one of the following genetic disorders human males and females are both equally affected ?

   (A) haemophilia

   (B) muscular Dystrophy

   (C) phenylketonuria

   (D) red green colour blindness

5. At present quite a large percentage of population of mosquitoes have become resistant to DDT. This is an example of

   (A) natural selection

   (B) differential reproduction

   (C) artificial selection

   (D) speciation

6. Why is ultrasound named so?

7. There are two unlabelled microscopic slides showing transverse sections of root and stem of a dicot plant. How will you differentiate between the two on the basis of the arrangement of the conducting tissues?

8. Why do we not perceive the colour of a red rose in very dim light?

SECTION - B

Q No 9-18 are of short answer type carrying 2 marks each. Answer them in approximately 20-30 words each

9. Name the kind of simple epithelium which forms the inner lining of (i) blood vessels and (ii) Fallopian tube. Mention one difference between the two

10. What does the study of biogeography relate to? How many major biogeographical realms are recognized? Name the realm that includes India in it.

11. Which two major techniques are used for blood urea estimation? Identify the step which is common to both of them.

12. What is a transgenic organism? Which gene was used in producing the abnormally large transgenic mouse?

13. What are the four conditions necessary to facilitate an efficient gaseous exchange between the respiratory surface of a vertebrate and its environment?

14. List any two structural differences between DNA and RNA.

15. What is Electrocardiography?

16. How is "elongation" carried out during protein synthesis in a cell?

17. A diploid cell having 8 chromosomes produces two types of gametes- one having 3 chromosomes and the other having 5 chromosomes. Name the phenomenon that may have occurred? How did it happen?

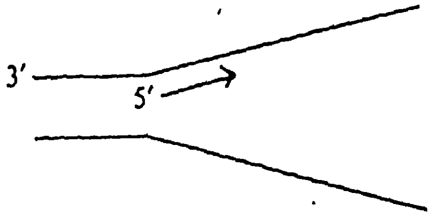
18. Suppose you had lived in seventeenth century and wanted to obtain a higher milk-yielding group of cows. How would you have proceeded? What is the biological term given to such a procedure?

SECTION – C

Q. Nos 19-27 are of short answer type carrying 3 marks each. Only one of these questions (Q No. 27) based on drawing skill has internal choice. Answer the rest in approximately 30-50 words each

19. What is meant by differential leucocyte count (DLC)? State the percentage of neutrophils and lymphocytes in the blood of a normal human adult.

20. Given below is an incomplete diagram representing a process in a living cell.



(i) Which particular process is intended to be shown in the diagram?

(ii) Redraw the diagram completing all the missing components.

(iii) Label each component.

21. *(i)* To which class of vertebrates would you assign *Archaeopteryx* ?

(ii) Name the category of evidence that suggests the existence of such an animal in the past.

(iii) Between which two groups of vertebrates does this animal serve as a connecting link.

22. Name and describe in brief the three phases of a sigmoid growth curve.

23. Differentiate between active and passive immunity. In which one of these will you categorize the immunity achieved through polio vaccine?

24. A plant is believed to be releasing oxygen during night time. Do you believe in the truthfulness of this statement ? Justify your answer by giving the reason.

25. In a patient the bile duct pouring into the duodenum has become completely choked for some reason. What will be the immediate effect of this choking on (i) nutrition and (ii) circulating blood? Explain

26. Why are cloning vectors necessary in cloning? Name any two such vectors that are used these days in experiments with *E.coli*

27. You have unconsciously pricked your hand with a pin. Draw a diagrammatic sketch of the reflex action involved in the withdrawal of your hand showing the anatomical and histological details of the parts involved

OR

Draw a diagram of the front view of human heart and label any six parts including at least two that are concerned with arterial blood supply to the heart muscles

SECTION – D

Q Nos 28 30 are long answer type carrying 5 marks each Of these two questions Q No 29 and 30 have internal choice Answer the questions in approximately 80-120 words each

28. Explain the various stages in the development of embryo sac from megaspore mother cell in a flowering plant. Draw the L S of an ovule showing mature megagametophyte and label its any six parts

29. Where does fertilization normally take place in the reproductive system of a human female? What helps the sperm to gain contact with the ovum and how? What is the significance of the point of entry of sperm.

OR

Describe spermatogenesis in human male.

30. Work out the phenotypic ratio obtained in F_2 generation of a cross between homozygous pea plants having round and yellow seeds with those having wrinkled and green seeds

OR

Name the components of the lac operon in *E.coli*. Explain the role of the operator in the expression of genes.

11. Techniques-

   (i) Reaction of ammonia with Nessler's reagent.

   (ii) Berthelot's reaction.

   Common Step - Liberation of ammonia from urea, by urease   4 × ½ = 2

12. Transgenic organism- organism produced by introduction of gene from different species. Gene for human growth hormone   1+1 =2

13. Thin

   Highly vascular rich in blood supply

   Permeable

   Large surface area

   - Moist surface

   (any *four*)   4 × ½ = 2

14.

	DNA	*RNA*
1.	Double Stranded	Single Stranded
2	Sugar-Deoxyribose	Ribose Sugar
3.	Thymine	Uracil

(Any *Two*)   2 × 1=2

15. Electrocardiography - (graphic) display/recording, of electrical voltages, produced by heart muscles, during cardiac cycles   4 × ½ = 2

16. Incoming amino-acyl-tRNA recognizes codon at A-site and binds there, peptide bond formed between new amino acids and growing polypetide chain, tRNA at A-site with polypetide chain moves by one triplet P site, new codon exposed at A-site   4 × ½ = 2

17 Phenomenon -- Non-disjunction, Homologous chromosomes in one of the pairs fail to separate during meiosis   1+1=2

18. Only calves of higher yielders chosen, allowed to breed for several generations   ½ + ½ = 1
Artificial selection   1

SECTION - C

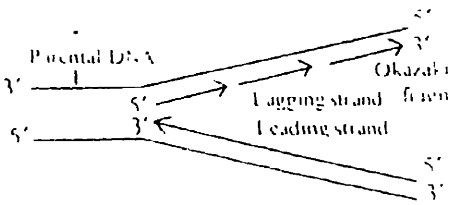
19. Percentage composition of different kinds of leucocytes in human blood   1

Neutrophils	40-75% (±5)	
Lymphocytes	20-45% (±5)	1 + 1 = 2

Q.No. *Value points/key* *Marks*

20. *(i)* (DNA) replication ½

Parental DNA 3'5' (or any other correct indication) 5'3' Okazaki fragments lagging strand leading strand (Drawn and labelled) (any five)



5 × ½ = 2½

21 *(i)* Aves

(ii) Paleontological

(iii) Reptiles *and* birds 3 × 1 = 3

22. Lag phase Initial slow growth of cells

Exponential phase Rapid Growth of cell

Stationary phase - Slow growth of cells 6 × ½ = 3

23. Active immunity Direct self generated response of the organism against invading antigen pathogen Passive immunity - indirect (from outside source) readymade factors/antibodies to destroy/neutralize the antigens/pathogens Active Immunity 3 × 1 = 3

24. No. Oxygen is released during photosynthesis/light reaction, photosynthesis cannot proceed in dark 3 × 1 = 3

25. Nutrition — No bile juice will reach duodenum, and hence no fat digestion. 2

Blood — bile pigments (or named pigments) enter blood circulation causing jaundice 1

26. Vectors — Gene carriers with desired gene/(short) stretch of DNA with desired gene. multiply to produce several copies of recombinant DNA. 1 + 1 = 2

Plasmids. bacteriophages, plant or animal viruses, transposons, jumping genes. artificial chromosomes of bacteria or yeast or mammal.
(any two) ½ + ½ = 1

27. Diagram showing . Sensory nerve leading to dorsal ganglion, dorsal horn of spinal cord, inter-connecting neuron, ventral horn of spinal cord, motor nerve, limb muscles, (arrows to point in correct direction) 6 × ½ = 3

OR

(Front view of heart) (No marking on any other view) diagram showing coronary artery. aorta. 2 × ½ = 1

any other **four** out of — Right auricle, right ventricle, left auricle, left ventricle. coronary vein superior vena cava, inferior vena cava, pulmonary vein, pulmonary artery 4 × ½ = 2

Q. No. *Value points/key* *Marks*

28. Diploid megaspore mother cell undergoes meiosis, forming four haploid megaspores out of which three degenerate/one survives, functional megaspore which undergoes mitosis thrice
4 × ½ = 2

((Correct diagram with 6 correct labellings) 6 × ½ = 3

29 Fallopian tube 1

sperm hyaluronidase sperm lysins, dissolves hyaluronic acid causes breaking of corona radiata/zona pellucida 3 × ½ = 1½

extrusion of polar bodies, determination of animal pole ½ + ½ = 1

OR

Sperm mother cell (2n), mitotic division, spermatogonium (2n), Growth and differentiation, primary spermatocyte (2n), meiosis I, Secondary spermatocyte (n), meiosis II, spermatid, spermiogenesis (Described or partly or fully shown in a diagram) 10 × ½ = 5

30. Genotype of parents — RRYY, rryy,
4 types of gametes of F_1 generation — RY, Ry, rY, ry
phenotypic ratio of F_2 generation — 9 round yellow, 3 round green, 3 wrinkled yellow, 1 wrinkled green
(10 marking points) 10 × ½ = 5

OR

Lac operon consists of 3 structural genes working as a single unit. ½ + ½ = 1

Regulator gene produces mRNA, causes formation of repressor, which blocks the operator, ... switch off.

Lactose acts as inducer, modifies repressor, such that it cannot bind to the operator, switch on
8 × ½ = 4

QUESTION WISE ANALYSIS

Subject . Biology | *SAMPLE PAPER I* | Paper . Theory

Class XII | Marks . 70 | Time 3 hrs

Q. No.	*Objective*	*Unit/ Sub Unit*	*Form of Question*	*Difficulty Level*	*Marks Allotted*	*Estimated Time (minutes)*
1	K	U-2	VSA (MCQ)	C	1	1
2	K	U-3	VSA (MCQ)	B	1	1
3	A	U-1	VSA (MCQ)	A	1	1
4	U	U-5	VSA (MCQ)	B	1	1
5	U	U-4	VSA (MCQ)	B	1	1
6	U	U-5	VSA	B	1	1
7	U	U-1	VSA	B	1	1
8	A	U-2	VSA	B	1	
9	K	U-2	SA-II	B	2	1
10	K	U-4	SA-II	B	2	4
11	K	U-5	SA-II	B	2	4
12	U	U-3	SA-II	A	2	4
13	U	U-2	SA-II	B	2	4
14	U	U-3	SA-II	C	2	4
15	U	U-5	SA-II	B	2	4
16.	U	U-3	SA-II	B	2	4
17.	A	U-3	SA-II	B	2	4
18.	A	U-4	SA-II	B	2	4
19.	K	U-5	SA-I	B	3	8
20.	K	U-3	SA-I	A	3	8
21.	K	U-4	SA-I	B	3	8
22.	U	U-I	SA-I	B	3	8
23.	U	U-5	SA-I	C	3	8
24.	A	U-I	SA-I	B	3	8
25.	A	U-2	SA-I	B	3	8
26.	A	U-5	SA-I	B	3	8
27.	S	U-2	SA-I	B	3	8
28.	K	U-I	LA	C	5	12
29.	U	U-2	LA	B	5	12
30.	U	U-3	LA	A	5	12

Note : Use abbreviatios as follows :

(a) for objectives : K - Knowledge, U - Understanding, A - Application, S - Skill

(b) for form of question : O - Objective, VSA - Very Short Answers, SA - Short Answer, LA - Long Answer.

MATHEMATICS

CLASS XII

8.2

DESIGN OF THE QUESTION PAPER

Time : 3 Hours | Maximum Marks: 100

The weightages of marks over different dimensions of the question paper shall be as follows

1. Weightage to learning Outcomes:

S.No.	Outcomes	Marks	Percentage of Marks
1.	Knowledge	24-30	24-30
2.	Understanding	44-50	44-50
3	Application & Skill	20-26	20-26

PART -A

(CORE TOPICS-Compulsory)

2. Weightage to different topics/Content Units

S.No.	Topics	Marks
1.	Differential Calculus	20
2.	Integral Calculus	20
3.	Differential Equations	06
4.	Determinants and Matrices	12
5.	Probability and Statistics	12
	Total	70

Note: A student has to opt for either Part B or Part C.

PART B

S.No.	Topics	Marks
1.	More on Vectors and three dimensional Geometry	14
2.	More on differential equations	04
3.	Elementary Statics and Dynamics	12
	Total	30

PART C

S.No.	Topics	Marks
1.	More on Statistics and Probability theory	14
2.	More on Commercial Mathematics	10
3.	Linear Programming	06
	Total	30

3. Weightage to Type/Forms of Questions

S No	Form of Questions	Marks to each Question	No of Questions	Total Marks	Percentage of Marks
1	Very Short Answer Type	2	15	30	30
2	Short Answer Type	4	10	40	40
3	Long Answer Type	6	05	30	30

The expected length of answers under different types/forms of questions would be as follows

S No	Form of Question	Expected Length
1	Long Answer Type	More than 5 Credit points
2	Short Answer Type	4-5 credit points
3	Very short Answer Type	Upto 3 credit points

4. Difficulty level of questions:

S No	Estimated Difficulty Level	Percentage of marks
1	Easy	16
2	Average	70
3	Difficult	14

A question may vary in difficulty level from individual to individual. As such the assessment in respect of each question will be made by the paper setter, on the basis of general anticipation from the group as a whole taking the examination This provision is only to make the paper balanced in its weight rather than to determine the pattern of marking at any stage

Based on the above design, there are three separate sample papers -I,II and III along with their Marking Schemes, Blue Prints, as well as Question Wise Analysis

Sample Paper II

Time 3 hrs

SUBJECT : Mathematics

Class . XII

BLUE PRINT

Maximum Marks · 100

S. No C ective		Knowledge			Understanding			Application			Total
					Section A						Marks No of questi-
	Unit	LA	SA	VSA	LA	SA	VSA	LA	SA	VSA	
A-1	Differential Calculus		4(1)	2(1)		4(1)	2(1)	6(1)		2(1)	20(6)
A-2	Integral Calculus		4(1)	2(1)		4(1)	4(2)	6(1)			20(6)
A-3	Differential Equations			2(1)		4(1)					6(2)
A-4	Determinants & Matrices		4(1)		6(1)		2(1)				12(3)
A-5	Probability & Statistics			2(1)	6(1)		4(2)				12(4)
					Section B						
B-1	More on vectors & 3-D Geom			2(1)		4(1)	2(1)	6(1)			14(4)
B-2	More on Diff Equation		4(1)								4(1)
B-3	Statics & Dynamics					4(1)	4(2)		4(1)		12(4)
					Section C						
C-1	More on Statistics			2(1)		4(1)	2(1)	6(1)			14(4)
C-2	More on Commercial Maths.		4(1)			4(1)	2(1)				10(3)
C-3	Linear Programming						2(1)		4(1)		6(2)
Sub Total A & B			16(4)	10(5)	12(2)	20(5)	18(9)	18(3)	4(1)	2(1)	100(30)
Sub Total A & C			16(4)	10(5)	12(2)	20(5)	18(9)	18(3)	4(1)	2(1)	100(30)
Total Marks / No of Questions		26(9)			50(16)			24(5)			100(30)

Note The number of questions are put within the brackets and their marks outside their brackets

Summary Long Answer (LA) 5 x 6 = 30

Short Answer (SA) 10 x 4 = 40

Very Short Answer (VSA) 15 x 2 = 30

100

MATHEMATICS

SAMPLE PAPER - 1

Class XII

TIME ALLOWED . 3 Hours

Maximum Marks : 100

GENERAL INSTRUCTIONS

1 The question paper consists of three parts A, B and C Part A is compulsory for all students. In addition to part A, every student has to attempt either part B **or** part C.

2. All questions are compulsory

3. Write the serial number of the question before attempting it.

4. If you wish to answer any question already answered, cancel the previous answer

5. Use of calculators is not permitted. However, you may ask for logarithmic and statistical tables.

PART - A

Note . Question numbers 1 to 10 carry 2 marks each.

Question numbers 11 to 18 carry 4 marks each.

Question numbers 19 to 21 carry 6 marks each.

1. Evaluate $\lim_{x \to 0} \frac{\text{cosec}x - \cot x}{x}$

2. Verify Lagrange's mean value theorem for the function :

$f(x) = x\,(x-1)\,(x-2)$ in $[0, \tfrac{1}{2}]$

3. Use differentials to find the approximate value of $\sqrt[3]{0.026}$, upto 3 places of decimals.

4. If A and B are symmetric matrices, show that AB - BA is a skew symmetric matrix.

5. Solve the differential equation

$$(1 + \cos x)\frac{dy}{dx} = 1 - \cos x.$$

6. Evaluate : $\int \frac{dx}{\sqrt{x+3} - \sqrt{x+2}}$

7. Evaluate : $\int x \log x^2 \, dx$

8. Evaluate : $\int \frac{\sin(x+a)}{\sin(x-a)}\, dx.$

9. If A and B are independent events such that $P(A \cup B) = 0.6$ and $P(A) = 0.2$, find $P(B)$.

10 Seven competitors in a music competition are ranked by two judges x and y in the following order :

Competetor :	A	B	C	D	E	F	G
Rank given by x .	2	1	4	3	5	7	6
Rank given by y :	1	3	2	4	5	6	7

Find the coefficient of rank correlation.

11. Find the intervals in which the function

$f(x) = \sin^4 x + \cos^4 x,\ 0 \le x \le \pi/2$

is increasing or decreasing

12 Find the derivative of $\sin(x^2 + 3)$ w r t x, from first principle

13 Evaluate

$$\int \left[\log(\log x) + \frac{1}{(\log x)^2}\right] dx$$

14. Evaluate .

$$\int_1^3 (2x^2 + 5x)\, dx$$

by the method of Limit of sum

15 Solve : $(2x - 10y^3)\frac{dy}{dx} + y = 0$

16 Using properties of determinants, prove that

$$\begin{vmatrix} b^2 + c^2 & ab & ca \\ ab & c^2 + a^2 & bc \\ ca & bc & a^2 + b^2 \end{vmatrix} = 4a^2b^2c^2$$

17. A bag contains 4 red and 5 black balls Another bag contains 3 red and 6 black balls One ball is drawn at random from the first bag and two balls are drawn from the second bag Find the probability that out of the three, two are black and one is red

18 Find the appropriate regression equation for the following data

Independent variable (x) .	2	4	5	6	8	11
Dependent variable (y) :	18	12	10	8	7	5

19 Show that the volume of the greatest cylinder which can be inscribed in a cone of height 'h' and semivertical angle 'θ' is $\frac{4}{27}\pi h^3 \tan^2\theta$

20 Solve the following system of equations by matrix method where $x \neq 0,\ y \neq 0,\ z \neq 0$

$$\frac{2}{x} - \frac{3}{y} + \frac{3}{z} = 10$$

$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 10$$

$$\frac{3}{x} - \frac{1}{y} + \frac{2}{z} = 13$$

21 Draw a rough sketch of $y^2 = x + 1$ and $y^2 = -x + 1$ and determine the area enclosed by the two curves

PART - B

Note : Question numbers 22 to 26 carry 2 marks each.

Question numbers 27 and 28 carry 4 marks each.

Question numbers 29 and 30 carry 6 marks each

22. Find a vector of magnitude 7 units which is perpendicular to two vectors $2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + \hat{j} - \hat{k}$

23. Find the point of intersection of the line $\bar{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(2\hat{i} + \hat{j} + 2\hat{k})$ and the plane $\bar{r}\cdot(2\hat{i} - 6\hat{j} + 3\hat{k}) + 5 = 0$.

24. Three forces acting on a particle are in equilibrium. The angle between the first and second is 90^0 and between the second and third is 120^0. Find the ratio of the magnitude of the forces.

25. Two forces of magnitudes 8N and 6N act at a point and the angle between them is 60^0. Find the magnitude and direction of their resultant.

26. To a man walking at the rate of 6km h^{-1} towards east, rain appears to fall vertically downward. Find the actual direction of the rain if its actual velocity is 12 km.h^{-1}.

27. Using vectors, show that the right bisectors of the sides of a triangle are concurrent.

28. Solve the differential equation :

$$\frac{dy}{dx} = \frac{x + 2y - 5}{2x + y - 4}$$

29. Find the shortest distance and the equation of the line of shortest distance between the lines.

$$\bar{r} = 3\hat{i} + 5\hat{j} + 7\hat{k} + \lambda(\hat{i} - 2\hat{j} + \hat{k})$$

$$\text{and } \bar{r} = -\hat{i} - \hat{j} - \hat{k} + \mu(7\hat{i} - 6\hat{j} + \hat{k})$$

30. A particle is projected with a velocity of 24 ms^{-1} at an angle of elevation of 60^0. Find
    (a) the equation of its path,
    (b) the length of the latus rectum of the path,
    (c) its time of flight,
    (d) height of its directrix,
    (e) maximum height attained by it, and
    (f) its horizontal range.

PART - C

Note : Question numbers 22 to 26 carry 2 marks each.

Question numbers 27 and 28 carry 4 marks each.

Question numbers 29 and 30 carry 6 marks each.

22. The first three moments of a distribution about the value 4 are 1.5, 17 and -30 respectively. Determine the value of μ_2 and μ_3.

23. Obtain the Binomial distribution whose mean is 10 and standard deviation is $2\sqrt{2}$.

24. A, B and C entered into a partnership with a capital of Rs 5,00,000/-, Rs. 6,50,000 and Rs. 8,00,000 respectively. The business yielded a total annual profit of Rs. 9,60,000. If an amount of Rs.15,000 per month is paid towards the rent of the business premises, out of the profit, find the share of partner A in the remaining profit, if they have to share profits in the ratio of their capitals.

---

25 If $C = ax^2 + bx + k$ is the total cost function, find

(i) slope of average cost function (AC function) and

(ii) slope of marginal cost function (MC function).

26. Mr. X decides to deposit Rs. 5000 at the end of each year in a bank, which pays compound interest at the rate of 5% per annum. What will be his total accumulation at the end of 15 years? [Given $(1.05)^{15} = 2.080$].

27. For a Poisson distribution, it is given that, $P(x=1)=P(x=2)$. Find the value of mean of the distribution. Hence find $P(x=0)$ and $P(x=4)$.

28. A machine costs a company Rs. 97,000 and its effective life is estimated to be 12 years. A sinking fund is created for replacing the machine by a new model at the end of its life time, when its scrap will realize a sum of Rs. 2,000 only. Find what amount should be set aside at the end of every year, out of profits for sinking fund if it accumulates at 5% per annum compounded annually. (Given . $(1.05)^{12} = 1\ 797$)

29. In a competitive examination, an examinee either guesses or copies or knows the answer to a multiple choice question with four choices. The probability that he makes a guess is 1/3 and the probability that he copies the answer is 1/6 The probability that the answer is correct, given that he copied it is 1/8 Find the probability that he knows the answer to the question, given that he correctly answered it

30. A small firm manufactures gold rings and chains. The combined number of rings and chains manufactured per day is atmost 24. It takes one hour to make a ring and half an hour for a chain The maximum number of hours available per day is 16 If the profit on a ring is Rs 300/ and on a chain is Rs. 190/, how many of each should be manufactured daily so as to maximize the profit

SAMPLE PAPER 1

Class XII

MARKING SCHEME

Mathematics

PART A

Question No.	Value Points or expected answer	Marks
1	$\lim\limits_{x\to 0} \frac{\operatorname{cosec}x - \cot x}{x} = \lim\limits_{x\to 0} \frac{1-\cos x}{x \sin x}$	½
	$= \lim\limits_{x\to 0} \left(\frac{1}{1+\cos x}\right) \left(\frac{\sin x}{x}\right)$	1
	$= \frac{1}{2}$	½
2	f(x) being a polynomial in x is continuous in [0, ½] and differentiable in]0,½[	½
	$f'(c) = \frac{f(½) - f(0)}{(½ - 0)}$ to get $12c^2 - 24c + 5 = 0$	1
	$c = 1 - \frac{\sqrt{21}}{6} \in]0, ½[$	½
3	$y = x^{1/3} \Rightarrow y + \Delta y = (x + \Delta x)^{1/3}$	
	$\Rightarrow (x + \Delta x)^{1/3} \cong x^{1/3} + \frac{dy}{dx}\Delta x$	½
	$(x + \Delta x)^{1/3} \cong x^{1/3} + \frac{1}{3x^{2/3}}\Delta x$	½
	Putting $x = 0.027$ and $\Delta x = -0.001$	½
	$(0.026)^{1/3} \cong 3 - \frac{1}{270} = 0.296$	½
4	$(AB - BA)' = B'A' - A'B'$	½
	$= BA - AB$ (∵ $A' = A$ and $B' = B$)	½
	$= -(AB - BA)$	½
	Hence (AB - BA) is skew symmetric	½
5	$dy = \frac{1 - \cos x}{1 + \cos x} dx$	½
	$= \tan^2 x/2 \, dx$	½
	Integrating to get $y = 2 \tan x/2 - x + c$	1
6	$I = \int \frac{1}{\sqrt{x+3} - \sqrt{x+2}} \left(\frac{\sqrt{x+3} + \sqrt{x+2}}{\sqrt{x+3} + \sqrt{x+2}}\right) dx$	½
	$= \int \left(\sqrt{x+3} + \sqrt{x+2}\right) dx$	½
	$= \frac{2}{3}\left[(x+3)^{3/2} + (x+2)^{3/2}\right] + c$	1

7. $I = \int x \log x^2 \, dx = \int 2x \log x \, dx$ ½

Integrating by parts to get

$I = x^2 \log x - \int \frac{1}{x} \; x^2 \, dx$ 1

$= x^2 \log x - \frac{x^2}{2} + c$ ½

8 $I = \int \frac{\sin(x + a)}{\sin(x - a)} dx = \int \frac{\sin(\overline{x-a} + 2a)}{\sin(x - a)} dx$ ½

$= \int \frac{\sin(x-a)\cos 2a + \cos(x-a)\sin 2a}{\sin(x-a)} dx$ ½

$= x\cos 2a + \sin 2a \log|\sin(x-a)| + c$ 1

9. For independent events $P(A \cap B) = P(A) \; P(B)$ ½

$\because P(A \cup B) = P(A) + P(B) - P(A)\, P(B)$ ½

$\Rightarrow 0.6 = 0.2 + P(B) - (0.2)P(B)$ ½

$\therefore P(B) = 0.5$ ½

10 Take A = B = 4

$\sum u_i = \sum(x_i - 4) = 0, \sum v_i = \sum(y_i - 4) = 0,$

$\sum u_i v_i = 22, \sum u_i^2 = 28, \sum v_i^2 = 28$ 1

Using $r(x, y) = r(u, v) = \frac{n\sum u_i v_i - \sum u_i \sum v_i}{\sqrt{\left[n\sum u_i^2 - \left(\sum u_i\right)^2\right]\left[n\sum v_i^2 - \left(\sum v_i\right)^2\right]}}$ ½

$= \frac{7 \times 22}{7 \times 28} = \frac{11}{14}$ or 0.786 ½

11 $f'(x) = 4\sin^3 x \cos x - 4\cos^3 x \sin x$

$= -\sin 4x$ 1

Now $f'(x) \geq 0 \Rightarrow \sin 4x \leq 0 \Rightarrow \pi \leq 4x \leq 2\pi \Rightarrow \frac{\pi}{4} \leq x \leq \frac{\pi}{2}$

$\Rightarrow$ f(x) is increasing in $\left(\pi/4, \pi/2\right)$ 1½

Also $f'(x) \leq 0 \Rightarrow \sin 4x \geq 0 \Rightarrow 0 \leq 4x \leq \pi \Rightarrow 0 \leq x \leq \pi/4$

$\Rightarrow$ f(x) is decreasing in $\left(0, \pi/4\right)$. 1½

12 $\frac{\Delta y}{\Delta x} = \frac{\sin(x^2 + 3 + \Delta x^2 + 2x\Delta x) - \sin(x^2 + 3)}{\Delta x}$ 1

$= \frac{2\cos\left(x^2 + 3 + \frac{\Delta x(\Delta x + 2x)}{2}\right)\sin\left[\frac{\Delta x(\Delta x + 2x)}{2}\right]}{\Delta x}$ 1

$\frac{dy}{dx} = \lim_{\Delta x \to 0} \frac{\cos\left[x^2 + 3 + \frac{\Delta x(\Delta x + 2x)}{2}\right]\sin\left[\frac{\Delta x(\Delta x + 2x)}{2}\right]}{\frac{\Delta x(\Delta x + 2x)}{2}}$ $(\Delta x = 3x)$

$= 2x\cos(x^2 + 3)$

13 $\log x = t \Rightarrow x = e^t$ and $dx = e^t dt$ ½

$I = \int\left(\log t + \frac{1}{t^2}\right)e^t\,dt = \int\left(\log t + \frac{1}{t} - \frac{1}{t} + \frac{1}{t^2}\right)e^t\,dt$ 1

$= \int\left(\log t + \frac{1}{t}\right)e^t\,dt + \int\left(-\frac{1}{t} + \frac{1}{t^2}\right)e^t\,dt$ ½

using $\int[f(x) + f'(x)]\,e^x\,dx = f(x)\,e^x + c$ ½

$= e^t \log t + e^t\left(-\frac{1}{t}\right) + c$ 1

$= x\left(\log(\log x) - \frac{1}{\log x}\right) + c$ ½

14 $a = 1,\ b = 3,\ h = 2/n$ ½

Writing or using

$I = \lim_{h\to 0} h\left[f(a) + f(a+h) + f(a+2h) + .. + f(a+\overline{n-1}\,h)\right]$ 1

$= \lim_{h\to 0} \frac{2}{n}\left[(7+7+ \ldots\ldots n \text{ terms}) + 9h(1+2+3+\ldots+\overline{n-1})\right.$

$\left. +2h^2(1^2+2^2+3^2+\ldots\ldots+(\overline{n-1})^2\right]$ 1

$= \lim_{n\to\infty} \frac{2}{n}\left[7n + \frac{18}{n}\cdot\frac{n(n-1)}{2} + \frac{8}{n^2}\ \frac{n(n-1)(2n-1)}{6}\right]$ 1

$= 112/3$ ½

15 The given differential equation is

$\frac{dx}{dy} + \frac{2}{y}\ x = 10y^2$ 1

Integrating factor $= e^{\int\frac{2}{y}dy} = y^2$ 1

$\Rightarrow xy^2 = \int 10y^4\,dy + c$ 1

$xy^2 = 2y^5 + c$ 1

16 Operating aC_1, bC_2, cC_3 & taking a, b, c common from R_1, R_2, R_3 respectively to get

Determinant $= \begin{vmatrix} b^2+c^2 & b^2 & c^2 \\ a^2 & c^2+a^2 & c^2 \\ a^2 & b^2 & a^2+b^2 \end{vmatrix}$ 1

$C_1 \to C_1 - (C_2 + C_3) = 2\begin{vmatrix} 0 & b^2 & c^2 \\ -c^2 & c^2+a^2 & c^2 \\ -b^2 & b^2 & a^2+b^2 \end{vmatrix}$ 1

$C_2 \to C_2 + C_1$

$C_3 \to C_3 + C_1$ $= 2\begin{vmatrix} 0 & b^2 & c^2 \\ -c^2 & a^2 & 0 \\ -b^2 & 0 & a^2 \end{vmatrix}$ 1

$4a\,b^2c^2$ 1

17 Required probability

= P(a red ball from first bag and two black balls from second bag) + P(a black ball from first bag and one black and one red ball from second bag) 1½

$$= \frac{4}{9}\ \frac{{}^6C_2}{{}^9C_2} + \frac{5}{9}\ \frac{{}^3C_1\ {}^6C_1}{{}^9C_2}$$ 1½

$$= \frac{5}{27} + \frac{5}{18} = \frac{25}{54}$$ 1

18 Since x is independent variable & y is the dependent variable, so the appropriate regression line is y on x ½

$\bar{x} = 6,\ \bar{y} = 10$ ½

$\sum(x_i - \bar{x})^2 = 50,\ \sum(x_i - \bar{x})(y_i - \bar{y}) = -67$ 1

$$b_{yx} = \frac{\sum[(x_i - \bar{x})(y_i - \bar{y})]}{\sum(x_i - \bar{x})^2} = -1.34$$ 1

Regression line of y on x is $y - \bar{y} = b_{yx}(x - \bar{x})$ ½

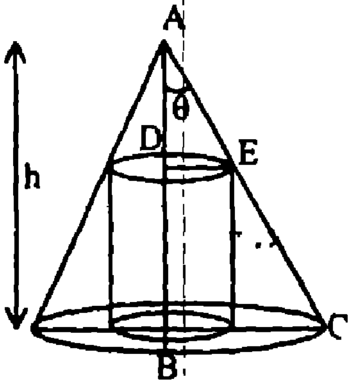
$\Rightarrow y = -1.34x + 18.04$ ½

19 Let radius of cylinder = y

and height of cylinder = x

Also let radius of cone = r

$\Rightarrow$ Volume of cylinder, $V = \pi x y^2$ 1



$$\tan\theta = \frac{DE}{AD} = \frac{BC}{AB} \Rightarrow y = \frac{r}{h}(h - x)$$ 1

$$\therefore V = \frac{\pi r^2}{h^2}\left[x^3 - 2hx^2 + h^2x\right]$$ 1

$$\frac{dV}{dx} = 0 \Rightarrow x = h/3$$ 1

showing $\frac{d^2V}{dx^2} < 0$ for $x = \frac{h}{3}$ ½

$\Rightarrow x = \frac{h}{3}$ will give maximum volume ½

and maximum volume $= \frac{4}{27}\pi \tan^2\theta\, h^3$ 1

20
$$\begin{pmatrix} 2 & -3 & 3 \\ 1 & 1 & 1 \\ 3 & -1 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 10 \\ 10 \\ 13 \end{pmatrix}$$ 1

or $AX = B \Rightarrow X = A^{-1}B$

$|A| = -9$ 1

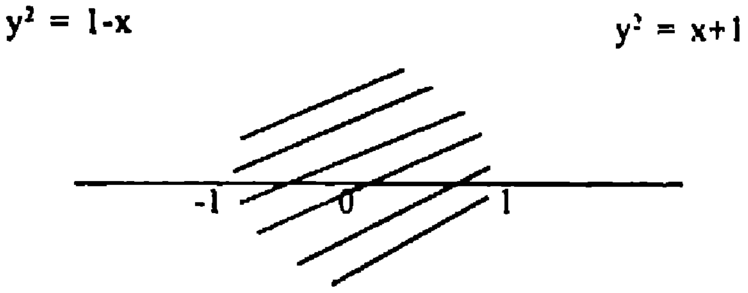
$$\text{Adj } A = \begin{pmatrix} 3 & 3 & -6 \\ 1 & -5 & 1 \\ -4 & -7 & 5 \end{pmatrix}$$ 2

$$\begin{pmatrix} 1/x \\ 1/y \\ 1/z \end{pmatrix} = -\frac{1}{9}\begin{pmatrix} 3 & 3 & -6 \\ 1 & -5 & 1 \\ -4 & -7 & 5 \end{pmatrix}\begin{pmatrix} 10 \\ 10 \\ 13 \end{pmatrix}$$ ½

$$= \begin{pmatrix} 2 \\ 3 \\ 5 \end{pmatrix}$$ 1

$\Rightarrow x = 1/2,\ y = 1/3,\ z = 1/5$ ½

21 Figure with correct shaded portion 1



Point of intersection as x = 0 1

Required area $= 2\left[\int_{-1}^{0}\sqrt{x+1}\,dx + \int_{0}^{1}\sqrt{1-x}\,dx\right]$ 2

$= \frac{4}{3}\left[(x+1)^{3/2}\Big|_{-1}^{0} - (1-x)^{3/2}\Big|_{0}^{1}\right]$ 1

$= \frac{8}{3}$ sq units 1

PART - B

22 a, unit vector ⊥ to two vectors $\bar{a}$ and $\bar{b}$

$= \frac{\bar{a} \times \bar{b}}{|\bar{a} \times \bar{b}|}$ ½

$= \frac{3\hat{j} + 3\hat{k}}{3\sqrt{2}}$ or $\frac{\hat{j} + \hat{k}}{\sqrt{2}}$ 1

$\Rightarrow$ a vector of magnitude 7 units ⊥ to $\bar{a}$ and $\bar{b}$

$= \frac{7}{\sqrt{2}}\hat{j} + \frac{7}{\sqrt{2}}\hat{k}$ ½

23 Any point on the given line is

$(1 + 2\lambda,\ 2 + \lambda,\ 3 + 2\lambda)$ ½

If the line intersects the plane, then this point must lie on the plane for some value of λ.

$\Rightarrow 2(1 + 2\lambda) - 6(2 + \lambda) + 3(3 + 2\lambda) + 5 = 0$ ½

$\Rightarrow \lambda = -1$ ½

∴ point of intersection is (-1, 1, 1) ½

24 Let P, Q, R be the forces acting at O

⇒ by Lami's theorem: $\frac{P}{\sin120^0} = \frac{Q}{\sin150^0} = \frac{R}{\sin90^0}$ 1

$\frac{P}{\sqrt{3}/2} = \frac{Q}{1/2} = \frac{R}{1}$ ½

$\Rightarrow P \; Q \; R = \sqrt{3} \; 1 \cdot 2$ ½

25. $R^2 = P^2 + Q^2 + 2PQ \cos\alpha$ ½

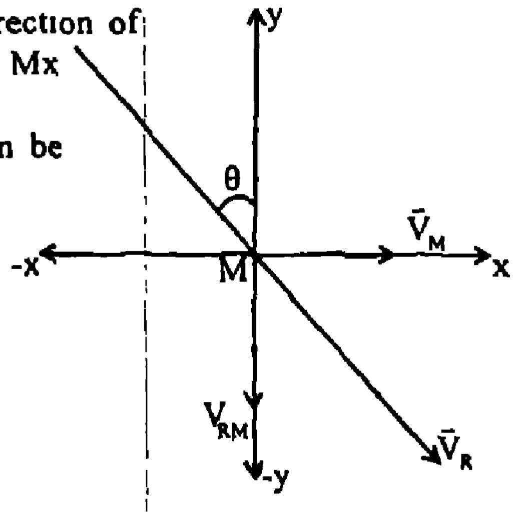
$= 8^2 + 6^2 + (2)(8)(6) \cos 60^0$

$= \sqrt{148}$ N ½

and $\tan\theta = \frac{Q \sin\alpha}{P + Q\cos\alpha} = \frac{6\,\sqrt{3}/2}{8 + 6\,1/2}$ ½

$\Rightarrow \theta = \tan^{-1}\left(\frac{3\sqrt{3}}{11}\right)$ ½

26 Let the man moves along Mx and let actual direction of rain make an angle of θ with yM where yM ⊥ Mx



Let the velocity of man, rain and rain w.r.t man be $\vec{V}_M$, $\vec{V}_R$ and $\vec{V}_{RM}$ respectively

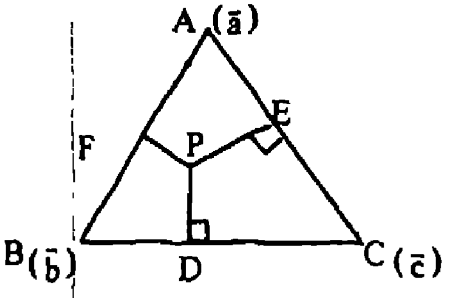
then $\vec{V}_R = \vec{V}_M + \vec{V}_{RM}$ 1

Resolving along Mx;

$V_R \sin\theta = V_M \Rightarrow 12\sin\theta = 6$ ½

$\Rightarrow \theta = 30^0$ ½

27. Let perpendicular bisectors of BC and AC meet at P. Let $\bar{a}$, $\bar{b}$, $\bar{c}$ and $\bar{p}$ be position vectors of points A, B, C and P respectively [for figure and above statement] ½



Now $\bar{P}D \cdot \bar{B}C = 0$ and $\bar{P}E \;\; \bar{A}C = 0$

$\Rightarrow \left(\frac{\bar{b} + \bar{c}}{2} - \bar{p}\right) \cdot (\bar{c} - \bar{b}) = 0 = \left(\frac{\bar{c} + \bar{a}}{2} - \bar{p}\right) \; (\bar{c} - \bar{a})$ 1

$\frac{\bar{c}^2 - \bar{b}^2}{2} - \bar{p}\,\bar{c} + \bar{p}\cdot\bar{b} = \frac{\bar{c}^2 - \bar{a}^2}{2} - \bar{p}\,\bar{c} + \bar{p}\,\bar{a}$ ½

$\frac{\bar{a}^2 - \bar{b}^2}{2} - \bar{p}\,(\bar{a} - \bar{b}) = 0$ 1

$\left(\frac{\bar{a} + \bar{b}}{2} - \bar{p}\right) \cdot (\bar{a} - \bar{b}) = 0$

$\therefore \bar{P}F \;\; \bar{A}B = 0$ or $PF \perp AB$ 1

28 Putting $x = X + h$, $y = Y + k$ to get

$$\frac{dY}{dX} = \frac{X + 2Y + h + 2k - 5}{2X + Y + 2h + k - 4}$$ ½

Putting $h + 2k - 5 = 0$ and $2h + k - 4 = 0$ and solving to get $h = 1$, $k = 2$ ½

$\Rightarrow \frac{dY}{dX} = \frac{X + 2Y}{2X + Y}$, Putting $Y = VX$ to get

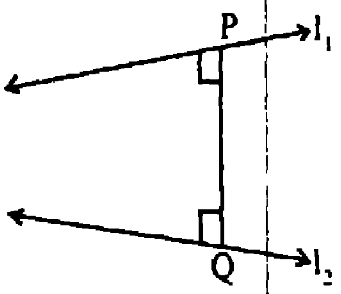
$$\frac{2 + V}{1 - V^2}dv = \frac{dX}{X}$$ 1

Integrating

$$\log\left|\frac{1 + V}{1 - V}\right| - \frac{1}{2}\log\left|1 - V^2\right| = \log|X| + \log c$$ 1

$\Rightarrow (x+y-3) = c'(x-y+1)^3 \Rightarrow (x+y-3) = c'(x-y+1)^3$ 1

29.



Any point (say P) on l_1 is $(3+\lambda, 5-2\lambda, 7+\lambda)$ and any point (say Q) on l_2 is $(-1+7\mu, -1-6\mu, -1+\mu)$

$\Rightarrow \vec{PQ} = (7\mu - \lambda - 4)\hat{i} + (-6\mu + 2\lambda - 6)\hat{j} + (\mu - \lambda - 8)\hat{k}$ 1

$$\left.\begin{aligned}\vec{PQ}\cdot(\hat{i} - 2\hat{j} + \hat{k}) = 0 \Rightarrow 20\mu - 6\lambda = 0\\ \vec{PQ}\cdot(7\hat{i} - 6\hat{j} + \hat{k}) = 0 \Rightarrow 86\mu - 20\lambda = 0\end{aligned}\right\}$$ 1

solving to get $\lambda = 0$, $\mu = 0$ 1

$\Rightarrow P(3, 5, 7)$ and $Q(-1, -1, -1)$ 1

$\Rightarrow$ shortest distance $= \left|\vec{PQ}\right| = 2\sqrt{29}$ 1

Equation of line of shortest distance is

$\vec{r} = (3\hat{i} + 5\hat{j} + 7\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 4\hat{k})$

or $\frac{x - 3}{2} = \frac{y - 5}{3} = \frac{z - 7}{4}$ 1

30. (a) Equation of path is

$$y = x\tan\alpha - \frac{1}{2}\frac{gx^2}{u^2\cos^2\alpha} \Rightarrow y = \sqrt{3}x - \frac{5x^2}{144}$$ ½+½

(b) Latus rectum $= \frac{2u^2\cos^2\alpha}{g} = \frac{144}{5}$ or 28.8 m ½+½

(c) greatest height $= \frac{u^2\sin^2\alpha}{2g} = 21\ 6$ m ½+½

(d) height of the directrix $= \frac{u^2}{2g} = 28\ 8$ m ½+½

(e) time of flight = $\frac{2u \sin\alpha}{g} = (2.4)(\sqrt{3})$ sec ½+½

(f) horizontal range = $\frac{u^2 \sin 2\alpha}{g} = (28.8)(\sqrt{3})$ m ½+½

PART - C

22 $\mu_1' = 1.5,\ \mu_2' = 17,\ \mu_3' = -30$

$\Rightarrow \mu_2 = \mu_2' - (\mu_1')^2 = 14.75$ 1

$\mu_3 = \mu_3' - 3\mu_2'\mu_1' + 2\mu_1'^3$

$= -30 - 3 \times 17 \times 1.5 + 2(1.5)^3$

$= -99.75$ 1

23 Mean = np = 10 and S D = $\sqrt{npq} = 2\sqrt{2}$

$\Rightarrow npq = 8$

q = 4/5 and p = 1/5 ½

$\Rightarrow$ n = 50 ½

required distribution is given by

$P(x = r) = {}^{50}C_r \left(\frac{1}{5}\right)^r \left(\frac{4}{5}\right)^{50-r}, r = 0, 1, 2, \ldots, 50$ 1

24 Remaining Profit = Rs. (9,60,000 - 1,80,000)

= Rs. 7,80,000 1

Ratio of investment of A, B, C = 10:13 16 ½

$\Rightarrow$ A's share = $\frac{10}{39}(780000)$ = Rs. 2,00,000 ½

25 Average Cost = $\frac{C}{x} = ax + b + \frac{k}{x}$ ½

∴ slope of average cost function = $\frac{d}{dx}(AC)$

$= a - k/x^2$ ½

Marginal cost = $\frac{d}{dx}$ (Total cost function)

$= 2ax + b$ ½

∴ Slope of (MC) function = $\frac{d}{dx}(2ax + b) = 2a$ ½

26 Required amount = Rs. $5000\left[\frac{(1.05)^{16} - 1}{05}\right]$ 1

= Rs 108000 1

27. Since $P(x = r) = \frac{e^{-m}\ m^r}{r!}$

$\therefore P(x=1) = \frac{e^{-m}\ m}{1!} = me^{-m}$

$P(x=2) = \frac{m^2 e^{-m}}{2!}$ 1

$me^{-m} = \frac{m^2 e^{-m}}{2} \Rightarrow m = 2$ 1

Hence $P(x=0) = \frac{e^{-2} \cdot 2^0}{0!} = e^{-2}$ 1

$P(x=4) = \frac{e^{-2} \cdot 2^4}{4!} = \frac{e^{-2}\ 16}{24}$ or $\frac{2}{3}e^{-2}$ 1

28. Let Rs. 'R' be retained out of profit annually
$\Rightarrow$ amount of annuity of Rs. 'R' for 12 years at 5% p.a.
= Rs. (97000 - 2000) = Rs95000 ½

$\Rightarrow R\left[\frac{(1+i)^n - 1}{i}\right] = 95000$ where $n = 12$ and $i = \frac{5}{100}$ 1

$\Rightarrow R\ [(1.05)^{12} - 1] = 4750$
Now $(1.05)^{12} = 1.797$ 1
$\therefore R = \text{Rs } 5959.85$ 1½

29. Let event E_1 = "the examinee guesses the answer"
E_2 = "the examinee copies the answer"
E_3 = "the examinee knows the answer"
A = "the examinee answers correctly"

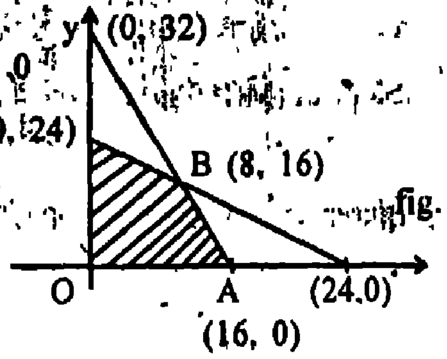
$\Rightarrow P(E_1) = \frac{1}{3}, P(E_2) = \frac{1}{6}$ 1

$\therefore P(E_3) = 1 - (\frac{1}{3} + \frac{1}{6}) = \frac{1}{2}$ 1
$P(A|E_1) = 1/4$ ($\because$ one out of 4 choices is correct) 1
since $P(A|E_2) = 1/8$
and $P(A|E_3) = 1$ 1

$$\Rightarrow P(E_3|A) = \frac{P(E_3) \cdot P(A|E_3)}{P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2) + P(E_3)\,P(A|E_3)}$$ 1

$$= \frac{24}{29}$$ 1

30. Let x be the number of rings & y be the number of chains manufactured perday. So the problem is
Maximise $Z = 300x + 190y$ ½
subject to: $x + y \le 24,\ x + \frac{1}{2}y \le 16,\ x \ge 0,\ y \ge 0$ 1½



The shaded portion represents the feasible region and maximum value of objective function Z is at one of the corner points A(16, 0) B(8, 16) C(0, 24) 1½
Value of $Z = 300x + 190y$ at

A(16, 0) = Rs 4800
B(8, 16) = Rs 5440
C(0, 24) = Rs 4560 1½

Hence maximum profit is Rs. 5440
and it occurs when x = 8 and y = 16 1

PAPER I

QUESTION WISE ANALYSIS

SUBJECT : MATHEMATICS | MAX MARKS 100

CLASS : XII | TIME · 3 HRS.

Q. NO.	OBJECTIVE	UNIT/SUB-UNIT	FORM OF QUESTION	MARKS ALLOTED	ESTIMATED TIME	ESTIMATED DIFFICULTY LEVEL
			PART -A			
1.	K	Differential Calculus	VSA	2	3	C
2	U	-----do-----	VSA	2	3	B
3.	A	-----do-----	VSA	2	4	B
4.	K	Determinants&Matrices	VSA	2	3	C
5.	K	Differential Equations	VSA	2	4	B
6.	K	Integral Calculus	VSA	2	3	C
7.	U	-----do-----	VSA	2	4	B
8.	U	-----do-----	VSA	2	4	A
9.	U	Probability&Statistics	VSA	2	3	B
10.	K	------do-----	VSA	2	4	B
11.	U	Differential Calculus	SA	4	6	A
12.	K	-----do-----	SA	4	6	B
13.	U	Integral Calculus	SA	4	6	B
14.	K	-----do-----	SA	4	6	B
15.	U	Differential Equations	SA	4	6	B
16.	U	Determinants&Matrices	SA	4	8	A
17.	U	Probability & Statistics	SA	4	6	B
18	U	-----do-----	SA	4	8	C
19.	A	Differential Calculus	LA	6	8	B
20.	U	Determinants&Matrices	LA	6	8	B
21.	A	Integral Calculus	LA	6	8	B

Q NO	OBJECTIVE	UNIT/SUB-UNIT	FORM OF QUESTION	MARKS ALLOTTED	ESTIMATED TIME	ESTIMATED DIFFICULTY LEVEL
			PART B			
22	K	Vectors and 3-D	VSA	2	3	C
23	U	-----do----	VSA	2	4	C
24	U	Statics and Dynamics	VSA	2	4	B
25	U	-----do- --	VSA	2	3	C
26	U	---- do-----	VSA	2	4	B
27	U	Vectors & 3-D	SA	4	4	B
28	U	More diff equation	SA	4	8	A
29	A	Vectors & 3-D	LA	6	9	B
30	A	Statics & Dynamics	LA	6	9	B
			PART - C			
22	K	Probability & Statistics	VSA	2	4	C
23	U	----do-----	VSA	2	3	C
24	U	Commercial Maths	VSA	2	4	C
25	U	-----do-----	VSA	2	4	B
26	K	-----do----	SA	2	6	B
27	U	Probability & Statistics	SA	4	6	B
28	K	Commercial Maths	SA	4	8	A
29	A	Probability & Statistics	LA	6	9	B
30	A	Linear Programming	LA	6	9	B

Note Use abbreviations as follows .

(a) For objectives K = Knowledge; U = Understanding, A = Application

(b) For Form Questions VSA = Very Short Answer; SA = Short Answer, LA = Long Answer

(c) For difficulty level of Questions A = Difficult, B = Average, C = Easy.

8.3

CHEMISTRY - CLASS XII
DESIGN OF THE QUESTION PAPER

Time : 3 Hours Max Marks 70

The weightage or the distribution of marks over different dimensions of the question paper shall be as follows :

1. **Weightage to Learning Outcomes**

S No	Learning Outcomes	Marks	Percentage of marks
1.	Knowledge	20	28 6%
2	Understanding	28	40%
3	Application	20	28 6%
4.	Skill	02	2 8
	Total	70	100

2. **Weightage to learning content-units :**

S. No.	Unit Content	Marks
1.	Atomic Structure and Chemical Bonding	4
2.	The Solid State	3
3.	Solutions	5
4.	Chemical Thermodynamics	5
5.	Electro-Chemistry	4
6.	Chemical Kinetics	4
7.	Organic Chemistry based on Functional Group - I	5
8.	Organic Chemistry based on Functional Group - II	5
9.	Organic Chemistry based on Functional Group - III	5
10.	Chemistry of Representative elements	6
11.	Transition metals including Lanthanides	6
12.	Coordination Chemistry and Organometallics	3
13.	Nuclear Chemistry	3
14	Synthetic and Natural Polymers	2
15	Surface Chemistry	3
16	Bio-molecules	3
17	Chemistry of Biological Processes	2
18	Chemistry in action	2
	Total	70

3. Weightage to forms of Questions

S No.	Form of Questions	Marks for each question	No. of questions	Total marks
1	Long Answer Type Qs	5	02	10
2	Short Ans Qs I	2	16	32
3	Short Ans Qs II	3	06	18
4	V. Short Answer Qs	1	10	10
			Total	70

Note : The expected length of answers and time taken under different forms of questions shall be as follows

S No	Form of Questions	Expected Length	Expected Time for Each	Total expected time
1	VSA Type	One word to two Sentences	1 min.	10 min.
2.	SA I Type	20 to 30 words	5 min	80 min.
3	SA II Type	30 to 40 words	8 min	48 min
4	E/LA Type	70 to 80 words	15 min.	60 min
			Total Time :	168 min.

This is only an approximation. Though students are advised to be as near the approximation as possible, the actual length, however, may vary As the total time is calculated on the basis of the number of questions required to be answered and the length of their anticipated answers, it would therefore, be advisable for the candidates to budget their time properly by avoiding details not required

4. Scheme of Options

(1) There will be no overall option in the form of 'Do any ten questions or so'

(2) Internal choices (either/or type) on a very selective basis may be given in long answer questions testing higher mental abilities.

(3) The alternate question given by way of choice would be based on the same objective and the unit It would have the same anticipated difficulty level and length of answer

5. Weightage to difficulty level of Questions :

S No	Estimated difficulty Level	Percentage
1	Easy	15%
2	Average	70%
3.	Difficult	15%

A question may vary in difficulty level from individual to individual As such the approximation in respect of each question will be made by the paper setter on the basis of general expectation from the group as a whole taking the examination

This provision is only to make the paper balanced in nature rather than to determine the pattern of marking at any stage

BLUE PRINT
(Sample Paper - 1)

SUBJECT : Chemistry
Maximum Marks : 70

Class : XII
Time : 3 hrs.

Objective	Knowledge			Understanding			Application			Skill	Total
Sl No. Form of Questions Content Unit	LA	SA	VSA	LA	SA	VSA	LA	SA	VSA		
1 Atomic Structure & Chemical Bonding	-	3(1)	1(1)	-	-	-	-	-	-	-	4(2)
2 The Solid State	-	-	1(1)	-	-	1(1)	-	-	1(1)	-	3(3)
3 Solutions	5(1)	-	-	-	-	-	-	-	-	-	5(1)
4 Chemical Thermodynamics	-	-	-	-	2(1)	-	-	2(1)	1(1)	-	5(3)
5 Electro-Chemistry	-	-	-	-	4(2)	-	-	-	-	-	4(2)
6 Chemical Kinetics	-	-	-	-	4(2)	-	-	-	-	-	4(2)
7 Organic Chemistry I	-	-	-	-	3(1)	-	-	2(1)	-	-	5(2)
8 Organic Chemistry II	-	-	-	-	3(1)	-	-	2(1)	-	-	5(2)
9 Organic Chemistry III	-	-	-	-	3(1)	-	-	2(1)	-	-	5(2)
10 Chemistry of rep Elements	-	-	-	-	2(1)	-	-	2(1)	-	2(1)	6(3)
11 Transition Metals	5(1)	-	-	-	-	-	-	-	1(1)	-	6(2)
12 Coordination Chemistry and Organo metallics	-	-	-	-	2(1)	1(1)	-	-	-	-	3(2)
13 Nuclear Chemistry	-	-	-	-	3(1)	-	-	-	-	-	3(1)

BLUE PRINT
(Sample Paper - I)

Class · XII
Time . 3 hrs.

SUBJECT · Chemistry
Maximum Marks : 70

Objective	Knowledge			Understanding			Application			Skill	Total
Sl No Form of Questions Content Unit	LA	SA	VSA	LA	SA	VSA	LA	SA	VSA		
14 Synthetic and Natural Polymers	-	-	-	-	-	-	-	2(1)	-	-	2(1)
15 Surface Chemistry	-	-	-	-	-	-	-	3(1)	-	-	3(1)
16 Bio-Molecules	-	-	1(1)	-	-	-	-	-	2(2)	-	3(3)
17 Chemistry of Bio Processes	-	2(1)	-	-	-	-	-	-	-	-	2(1)
18 Chemistry in action	-	2(1)	-	-	-	-	-	-	-	-	2(1)
Sub Total	10(2)	· 7(3)	3(3)	-	26(11)	2(2)	-	15(7)	5(5)	2(1)	70(34)
Total		20(8)			28(13)			20(12)		2(1)	70(34)

- Note : Figures within brackets indicate the number of questions and figures outside the brackets indicate marks
  - * Denote that marks have been combined to form one question.

Summary	No	Marks
Essay LA	02	10
Short Answer (S A) SA - I	16	32
Short Answer SA - II	06	18
Very Short Answer VSA	10	10
Total	34	70

CHEMISTRY (Theory)
SAMPLE PAPER I

Time 3 Hours　　　　Maximum Marks 70

General Instructions

- *I All questions are compulsory*
- *II Marks for each question are indicated against it*
- *III Question numbers 1 to 10 are very short-answer questions each of 1 mark. Answer these in one word, phrase or about one sentence each*
- *IV Question numbers 11 to 26 are short-answer questions of 2 marks each. Answer these in about 30 words each*
- *V Question numbers 27 to 32 are short-answer questions of 3 marks each. Answer these in about 40 words each*
- *VI Question numbers 33 and 34 are long-answer questions of 5 marks each. Answer these in about 70 words each*
- *VII Use log tables, if necessary*

1 Name the molecular shapes of (a) $[Ni(CN)_4]^{2-}$ (b) PCl_5 1

2 AgI crystallises in cubic close packed ZnS structure. What fraction of tetrahedral sites are occupied by Ag^+ ions ? P2 1

3 Name the class of compounds which on hydrolysis yield fatty acids and alcohols B 1

4 What causes the conduction of electricity by semi-conductors? P2 1

5 Write the formula of tetrachlorocuprate (II) ion. 1

6 Draw the shape of the structure obtained when two SiO_4^{4-} tetrahedra share a corner between themselves. P2 1

7 Name two parameters at which the entropy of a substance is taken as zero 1

8 Why does vanadium pentoxide act as a catalyst ? 1

9 The sucrose that we eat in daily life is converted into glucose and fructose. Name the enzyme which facilitates this chemical reaction. B 1

10 What happens when protein is denatured ? B 1

11 How does lipid metabolism take place in our body ? Write the various steps involved in this process B 2

12 How are azo dyes prepared? Why is the colour imparted by azo dyes to fabrics not fast? B 2

13 The enthalpy change for the transition of ice to liquid water is 6.0 kJ mol^{-1} at 273 K. Calculate the entropy change for this process. 2

14 The conductivity of an aqueous solution of sodium chloride in a cell is 92 $ohm^{-1} cm^{-1}$. The resistance offered by this cell is 247.8 ohm. Calculate the cell constant for this cell 2

15 Using Nernst equation explain the effect of change in (a) concentration (b) temperature on the electrode potential of a given half-cell

16 In a particular reduction process the concentration of a solution that is initially 0.24 M is reduced to 0.12 M in 10 hours and 0.06 M in 20 hours. What is the rate constant of this reaction ?

17 (a) Distinguish between order and molecularity of a reaction
(b) When are order and molecularity of a reaction equal ? 2

18 I Identify X in the following chemical reaction $Cl_2 + 2X \longrightarrow 2Cl + X_2$
II Arrange the following in the decreasing order of their ionic character.
M-F M-Cl M-Br M-I, where M represents a metal
III Which of the following is more covalent $SbCl_3$ or $SbCl_5$?

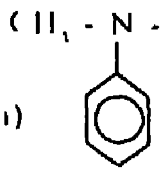
19 (a) Draw the geometrical isomers of $[Pt(NH_3)_2Cl_2]$
(b) Write the name of organometallic compound which is used as
(i) homogeneous catalyst, (ii) heterogeneous catalyst 2

20 (a) An endothermic reaction $A \longrightarrow B$ proceeds to completion
Deduce the sign of ΔS
(b) What will be the sign of ΔS for the following processes :-
(i) $NH_4Cl_{(s)} \longrightarrow NH_3(g) + HCl(g)$
(ii) Potassium nitrate crystallises from its saturated solution ?

21 A sweet-smelling organic compound A is slowly oxidized by air in the presence of light to a highly poisonous gas. On warming with silver powder, it forms a gaseous substance B, which is also produced by the action of calcium carbide on water. Identify A and B and write the chemical equations of the reactions involved 2

22 I How will you obtain acetaldehyde by using the following processes ?
(i) Dehydrogenation
(ii) Catalytic hydrogenation
Write the chemical equations of the reactions involved. 2
II (i) Why do aldehydes behave like polar compounds ?
(ii) Why do aldehydes have lower boiling points than the corresponding alcohols ?

23 Complete the following reactions -
(i) $CH_3NC \xrightarrow{H_2\ Pt}$
(ii) $CH_3CN \xrightarrow{LiAlH_4}$
(iii)



$+ HNO_2 \longrightarrow$

(iv) $CH_3CH_2CH_2CONH_2 \xrightarrow{P_2O_5}$

24 (a) Draw the structures of N_2O_5 and H_3PO_3

(b) Why does nitrogen not form pentahalides like phosphorus ?

25 Give one example for each of the following

(i) Thermoplastic Polymer

(ii) Natural Polymer

(iii) Condensation Polymer

(iv) Chain growth polymer

26 Draw a labelled diagram to show the dimeric structure of aluminium (III) chloride. State any one use of anhydrous aluminium (III) chloride with suitable reaction 2

27 State de-Broglie relation. The kinetic energy of a moving electron is 4.55×10^{-25} J. Calculate its wave length (mass of electron = 9.1×10^{-31} kg.) Planck's constant = 6.6×10^{-34} kg m^2s^{-1}.) 3

28 How can the following be obtained ?

(i) Phenol from benzene diazonium chloride

(ii) Glycerol from glyceride

(iii) 2, 4, 6. - tribromophenol from phenol. Write the chemical equations of the reactions involved 3

29 Explain the following with chemical equations or suitable reasoning :-

(a) To what oxidation state does ethanal reduce Cu(II)?

(b) Name the alkyl halide and sodium alkoxide used to synthesise tert-butylethylether

(c) Carboxylic acids do not exhibit the properties of carbonyl compounds 3

30 (a) Write the IUPAC name of $C_6H_5(CH_2)_2NH_2$

(b) What happens when (give equations only) Aniline is treated with sodium nitrite and HCl at 273 K.

(c) Write chemical equation for the reaction to prepare ethanamine from propanamide 3

31 (a) An element is present in Gp 18 and 5th period. What will be the position of the daughter element if the element emits a β particle ?

(b) In the sequence of the reactions,

$A \xrightarrow{\alpha} B \xrightarrow{-\beta} C \xrightarrow{-\beta} D$

What is the relationship between D and A 3

(c) A wood specimen from an archaeological finding shows a C^{14}_{6} activity of 3.8 counts per minute per gram of carbon. Calculate the age of the specimen ($t_{1/2}$ for C^{14}_{6} is 5770 yr. A fresh specimen of wood gives 15.3 counts per minute per gram of carbon)

32 (a) Distinguish between true solution and colloidal solution of same colour

(b) How are the following sols water prepared ?

(i) Sulphur and [illegible]

(c) Explain why deltas are formed where river and sea water meet

33. (a) When dried fruits and vegetables are placed in water for some time, they slowly swell. Why? How would an increase in temperature affect this process?

(b) The Osmotic pressure of 100 cm^3 of a solution containing 3.002 g of an unidentified solute is 2.55 atmosphere at 298 K. What is the molecular mass of the solute? (Given R = 0.0821 litre-atm. $mol^{-1}K^{-1}$) 5

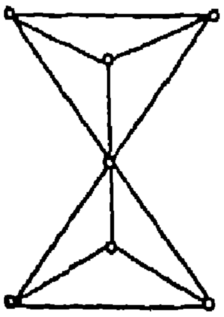
(c) Why do we get abnormal molecular mass in some cases while using colligative properties of solution?

34 (a) Describe the preparation of potassium dichromate from chromite ($FeCr_2O_4$) ore. Write the chemical equations of the reactions involved.

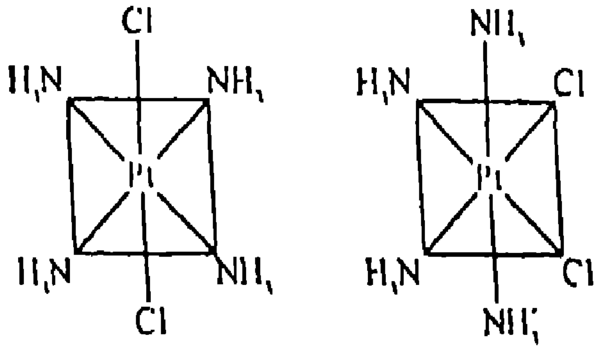
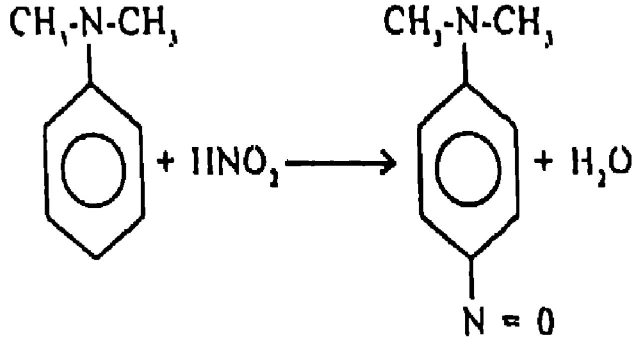
(b) Represent the reaction of acidified potassium dichromate with (i) KI solution and (ii) $FeSO_4$ solution with the help of chemical equations 5

(c) Draw the structure of the Chromate ion

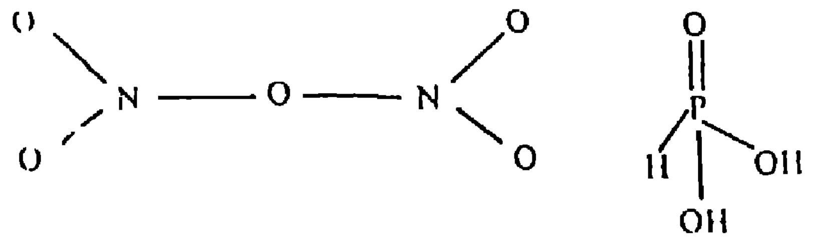
MARKING SCHEME
(SAMPLE - I)

Q.No	Credit/Value point	Value point wise Marks	Total marks
1.	i) Square Planar	½	1
	ii) Trigonal Bipyramid	½	
2.	Half (½)	1	1
3	Lipids	1	1
4	Electrons and holes	1	1
5	$[CuCl_4]^{2}$	1	1
6		1	1
7.	i) Perfectly crystalline ii) zero Kelvin	½, ½	1
8.	Vanadium exists in multiple oxidation states and can form unstable intermediate products with the reactant	1	1
9.	Invertase	1	1
10.	The protein loses its biological activity	1	1
11.	Most of the energy in fats is contained in the long hydro carbon chains of fatty acids. They are oxidized in mitochondria of liver cells and skeletal muscles During this process. ATP is produced	1	
	Lipids $\xrightarrow{\text{Hydrolysis}}$ Fatty acids+Glycerol $\xrightarrow{\text{Oxidation}}$ Acetyl Co A $\xrightarrow{\text{Citric Acid cycle}}$ ATP	1	2

12	Azo dyes are produced by coupling of phenol or naphthol with a diazonium salt. Azo dyes impart colour through surface adsorption involving weak bonds	1	2
13	$H_2O(s) \rightleftharpoons H_2O(l)$		
	$\Delta S_{fusion} = \frac{\Delta H_{fusion}}{T}$	½	
	$= \frac{6.0 \times 10^3\ J\ mol^{-1}}{273K}$	½	2
	$= 21.98\ J\ mol^{-1}\ K^{-1}$	½, ½	
	(1/2 mark is for units)		
14	$\text{Conductivity} = \frac{\text{Cell Constant}}{\text{Resistance}}$		
	Cell constant = Conductivity x Resistance	½	
	$= 92\ Ohm^{-1} cm^{-1} \times 247.8\ ohm$	½	2
	$= 22797.6\ cm^{-1}$	½, ½	
	(1/2 mark for units)		
15	For a half cell		
	$M^{n+}(aq) + ne \rightarrow M(s)$		
	$E_{M^{n+}/M} = E^\circ_{M^{n+}/M} + \frac{RT}{nF} \ln [M^{n+}]$	1	
	i) When concentration of the solution is increased the electrode potential of the half cell increases	½	2
	ii) When temperature is increased, the electrode potential of the half cell increases	½	
16.	(a) $t_{1/2} = 10$ hours	½	
	$k = \frac{0.693}{t_{1/2}}$	½	2
	$= \frac{0.693}{10\ h} = 6.9 \times 10^{-2}\ h^{-1}$		
	$= \frac{6.9 \times 10^{-2}\ h^{-1}}{60 \times 60\ s\ h^{-1}}$		
	$= 1.9 \times 10^{-5}\ s^{-1}$ (correct answer with units)	1	
17	a) Molecularity is the number of molecules, atoms or ions which are involved in the rate determining step while order of a reaction is the number of concentration terms in the experimentally detrmined rate law.	1	2
	b) Order and molecularity are the same in a single step chemical reaction e.g	½	
	$NO_2(g) + NO_2(g) \longrightarrow NO_3(g) + NO(g)$	½	

18	i) X = Br or I	½	
	ii) M-F > M-Cl > M-Br > M-I	1	2
	iii) $SbCl_3$	½	
19	 Trans Cis	½, ½	2
	b) Wilkinson's catalyst, Zeigler Natta catalyst	½, ½	
20	a) Since it is feasible so ΔG is negative As it is endothermic, ΔH is positive Hence for ΔG to be -ve, ΔS must be +ve (and $T\Delta S > \Delta H$)	1	2
	ii) i) increases ii) decreases	½, ½	
21.	A = $CHCl_3$	½	
	B = C_2H_2	½	
	$2CHCl_3 + O_2 \xrightarrow{light} 2COCl_2 + 2HCl$	½	2
	$2CHCl_3 + 6Ag \xrightarrow{Heat} C_2H_2 + 6AgCl$	½	
22.	(I)(i) $CH_3CH_2OH \xrightarrow[573\ K]{Cu} CH_3CHO$	½	
	(ii) $CH_3COCl + H_2 \xrightarrow{Pd/BaSO_4} CH_3CHO + HCl$	½	
	(II)(i) Carbonyl group is polar $\overset{\vert}{-C}^{\delta+} = O^{\delta-}$	½	
	ii) In CH_3CHO, hydrogen atoms are attached to carbon atom only and therefore they cannot form intermolecular hydrogen bonding.	½	2
23.	(i) CH_3NHCH_3	½	
	(ii) $CH_3CH_2NH_2$	½	
	(iii) 	½	2
	(iv) $CH_3CH_2CH_2CN$	½	

24



½, ½ 2

b) Nitrogen does not form pentahalides because it does not have vacant d-orbitals due to which it cannot expand its octet 1

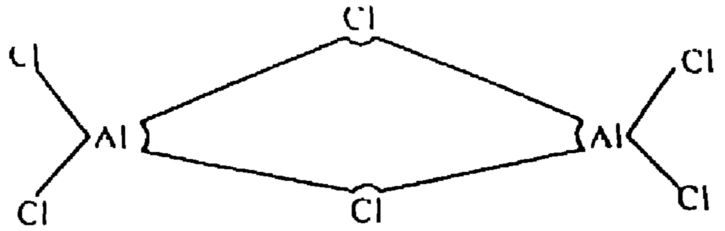
25 i) Polyethylene, Polystrene etc ½

ii) Cotton, Starch, Natural rubber, Cellulose etc, ½ 2

iii) Nylon, Terylene etc ½

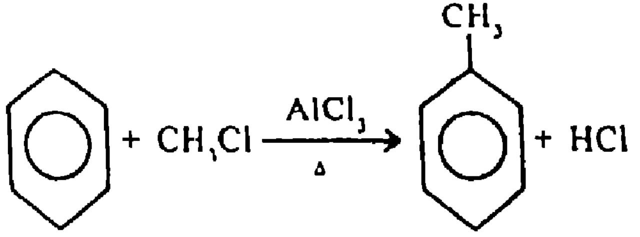
iv) PVC, Teflon etc ½

26



1 2

Anhydrous Aluminium Chloride is used as a catalyst in many organic reactions/Friedel Crafts's Reactions ½



½

27 $\lambda = h / mv$ ½

$$\frac{1}{2}mv^2 = 4.55 \times 10^{-25} J = 4.55 \times 10^{-25} \frac{kg\,m^2}{s^2}$$ ½

$$v^2 = \frac{9.1 \times 10^{-25}}{m} \frac{J}{kg}$$ ½

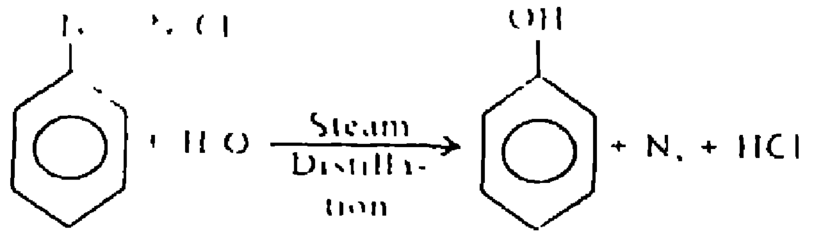
$$v^2 = \frac{9.1 \times 10^{-25}\,kg\,m^2}{9.1 \times 10^{-31}\,kg\,s^2} = 10^6\ m^2/s^2$$

or $v = 10^3$ m/s ½

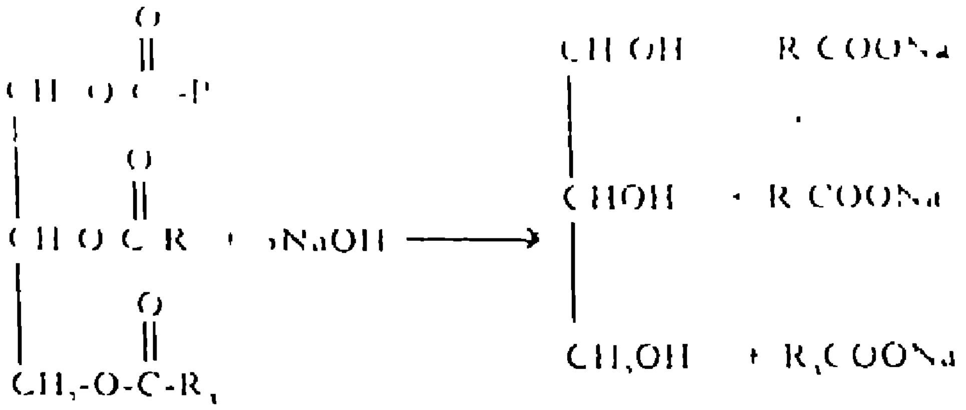
$$\lambda = \frac{h}{mv} = \frac{6.6 \times 10^{-34}\,kg\,m^2\,s^{-1}}{9.1 \times 10^{-31} \times 10^3\,kg\,m\,s^{-1}}$$ ½

$= 7.2 \times 10^{-7}$ m ½ 3

28

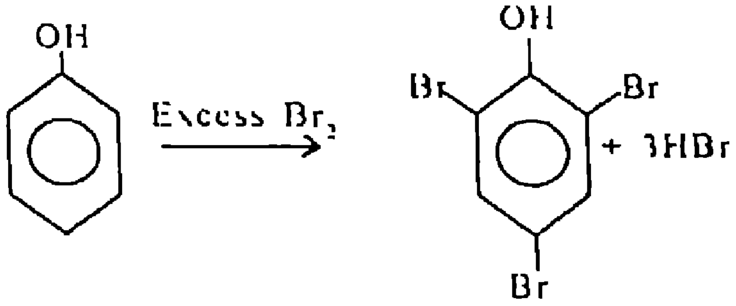


1



$$\begin{array}{l} CH_2-O-\overset{O}{\overset{\|}{C}}-R_1 \\ | \\ CH-O-\overset{O}{\overset{\|}{C}}-R_2 \quad + 3NaOH \longrightarrow \\ | \\ CH_2-O-\overset{O}{\overset{\|}{C}}-R_3 \end{array} \qquad \begin{array}{l} CH_2OH \quad + R_1COONa \\ | \\ CHOH \quad + R_2COONa \\ | \\ CH_2OH \quad + R_3COONa \end{array}$$

1

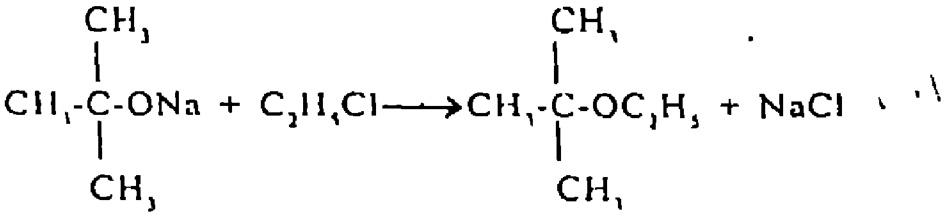


1

29 a) $CH_3CHO + Cu^{2+} + 3OH \longrightarrow CH_3COO + Cu_2O + 2H_2O$

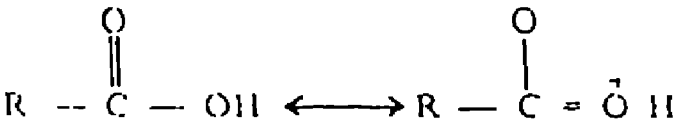
So Cu(II) is reduced to Cu(I) 1

b) Sodium tert butoxide and ethyl chloride will be used 1



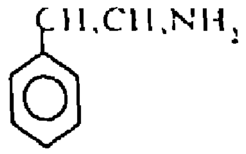
$$CH_3-\underset{CH_3}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-ONa + C_2H_5Cl \longrightarrow CH_3-\underset{CH_3}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-OC_2H_5 + NaCl$$

c) Carboxylic acid does not exhibit the properties of carbonyl group because resonance results in the decrease in carbonyl character of COOH group 1



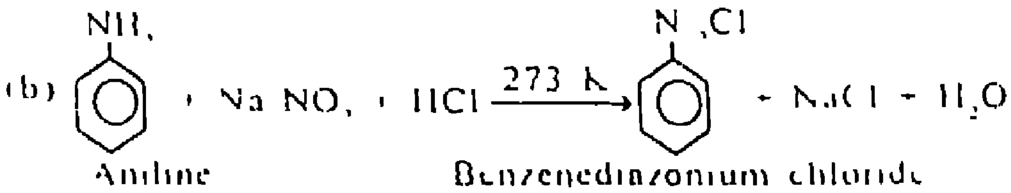
$$R-\overset{O}{\overset{\|}{C}}-OH \longleftrightarrow R-\overset{O^-}{\overset{|}{C}}=\overset{+}{O}H$$

30 (a)



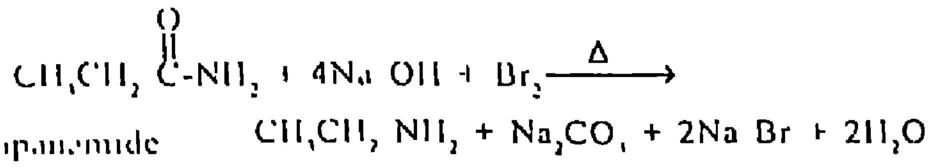
1 Amino 2 phenylethane or 1
2-Phenyl - 1 - ethanamine

(b)



1

(c)



$$CH_3CH_2\overset{O}{\overset{\|}{C}}\text{-}NH_2 + 4NaOH + Br_2 \xrightarrow{\Delta} CH_3CH_2NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

Propanamide Ethanamine 1

31 a) Emission of a β particle results in increase in Atomic number by one unit so the daughter element will be in Gp 1 and period 6 ½

b) Since D will have same atomic number as A but mass number decreases by four units so it will be an isotope of A ½ 3

c) $t_{1/2} = \frac{0.693}{\lambda}$ ½

or $\lambda = \frac{0.693}{5770\ yr} = 1.20 \times 10^{-4}\ yr^{-1}$ ½

$\log \frac{No}{Nt} = \frac{\lambda t}{2.303}$

$\log \frac{15.3}{3.8} = \frac{1.20 \times 10^{-4} \times t}{2.303}\ yr^{-1}$

$t = \frac{\log 4 \times 2.303}{1.20 \times 10^{-4}}\ yr$

$= 11540\ yrs$ 1

32 a) The colloidal solution will show Tyndall effect whereas a true solution will not do so 1

b) Sulphur Sol By bubbling Oxygen gas through a solution of H_2S in water. ½ 3

$Fe(OH)_3$ Sol By pouring a dilute solution of ferric chloride into boiling water or any other method. ½

c) River is a colloidal solution of negatively charged silicates dispersed in water Since sea water contains cations so it neutralises the anions leading to coagulation which result in the precipitation of silicates. It leads to the formation of deltas 1

33 a) Osmosis takes place, ½

the process will be accelerated ½

b) $\pi V = nRT$ ½

$n = \frac{\pi V}{RT} = \frac{2.55\ atm \times 0.1\ L}{0.0821\ litre\ atm\ mol^{-1}\ K^{-1} \times 298\ K}$ ½

$= \frac{2.55 \times 0.1}{0.0821 \times 298}\ mol$

$= 0.255/24.46\ mol$

$\frac{W}{M} = n$ ½

$\frac{3.002g}{M} = n$

$M = 3.002g/n$

$M(\text{Molar Mass}) = \frac{3.002 \times 24.46}{0.255}\ gmol^{-1}$

$= 287.8\ gmol^{-1}$ 1 5

(Units not mentioned - ½)

c) The solute particles associate or dissociate in the solution ½, ½

34 $K_2Cr_2O_7$ is obtained by the fusion of chromite ore ($Fe_2Cr_2O_4$) with molten alkali in presence of air

$4Fe_2Cr_2O_4 + 16NaOH + 7O_2 \longrightarrow$ 1

$8Na_2CrO_4 + 2Fe_2O_3 + 8H_2O$

$\downarrow$ Filter

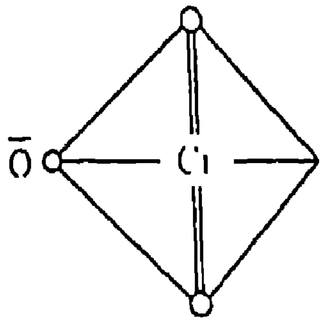
$2Na_2CrO_4 + 2H^+ \longrightarrow Na_2Cr_2O_7 + 2Na^+ + 2H_2O$ ½

$Na_2Cr_2O_7 + 2KCl \longrightarrow K_2Cr_2O_7 + 2NaCl$ ½

b) $K_2Cr_2O_7 + 7H_2SO_4 + 6KI \longrightarrow 4K_2SO_4 + Cr_2(SO_4)_3 + 7H_2O + 3I_2$ 1 5

$K_2Cr_2O_7 + 7H_2SO_4 + 6FeSO_4 \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + 7H_2O + 3Fe_2(SO_4)_3$ 1

c)



(CrO_4^{2-} ion) 1

Question - Wise Analysis

(Sample Paper - I)

Subject Chemistry M.M. 70

Class XII Time 3 Hours

Q No	Objective	unit/Sub-unit of design	Form of Question	Marks Alloted	Estimated Time (Minutes)	Estimated Difficulty Level
1	K	1	VSA	1	1	Easy (C)
2	K	2	VSA	1	1	Easy (C)
3	U	16	VSA	1	1	Easy (C)
4	U	2	VSA	1	1	Average (B)
5	U	12	VSA	1	1	Average (B)
6	Ap	2	VSA	1	1	Average (B)
7	Ap	4	VSA	1	1	Average (B)
8	Ap	11	VSA	1	1	Average (B)
9	Ap	16	VSA	1	1	Average (B)
10	Ap	16	VSA	1	1	Average (B)
11	K	17	SA - I	2	5	Easy (C)
12	K	18	SA - I	2	5	Easy (C)
13	U	4	SA - I	2	5	Diff (A)
14.	U	5	SA - I	2	5	Average (B)
15	U	5	SA - I	2	5	Average (B)
16	U	6	SA - I	2	5	Diff (A)
17.	U	6	SA - I	2	5	Diff (A)
18	U	10	SA - I	2	5	Average (B)
19	U	12	SA - I	2	5	Average (B)
20	Ap	4	SA - I	2	5	Average (B)

21	AP	7	SA - I	2	5	Average (B)
22	AP	8	SA - I	2	5	Average (B)
23	U	9	SA - I	2	5	Average (B)
24	AP	10	SA - I	2	5	Average (B)
25	AP	14	SA - I	2	5	Diff (A)
26	Skill	10	SA - I	2	5	Average (B)
27	K	1	SA - II	3	8	Average (B)
28.	U	7	SA - II	3	8	Average (B)
29	U	8	SA - II	3	8	Average (B)
30	U	9	SA - II	3	8	Diff (A)
31.	U	13	SA - II	3	8	Average (B)
32	AP	15	SA - II	3	8	Easy (C)
33	U	3	LA	5	15	Easy (C)
34	K	11	LA	5	15	Average (B)

Note : Use abbreviations as follows :

(a) For Objectives K = Knowledge, U = Understanding, A = Application, S = Skill

(b) For Form of questions O = Objective, VSA = Very short answer, SA = Short answer, LA = Long answer

(c) For difficulty level of questions A = difficult, B = Average, C = Easy

CHAPTER – IX
GRADING IN SCHOOLS

9.0 GRADING IN SCIENCE AND MATHEMATICS

Introduction:

1 Evaluation is an integral part of the teaching – learning process
2 Evaluation is a process of collecting, analysing and interpreting evidences of student's learning for making variety of decisions
3 While assessing students' achievement, we need to focus on students' progress with reference to
    - Self
    - Peer group
    - Criteria set by the teacher

9.1 WHAT IS GRADING

1 The word 'grade' is derived from the Latin word 'gradus' where it means 'step'
2 Grading is a process in which students may be classified into groups on the basis of their performance
3 Grading is a device of recording and reporting student's performance

9.2 FUNCTIONS OF GRADING

1 It gives an account of the extent to which the instructional objectives have been realised by the learner
2 It helps in making decisions pertaining to placement, promotions and awarding scholarship
3 It helps in reviewing transactional strategies and curricular appropriateness

9 3 LIMITATIONS OF MARKING SYSTEM

1 Currently students' achievement is being carried out only in scholastic areas by awarding marks on a 101-point scale that runs from 0-100
    a Where zero is not absolute zero It does not represent nothingness of an attribute,
    b Where 100 is not the absolute 100 It does not represent mastery level in the subject

2 The scale so used suffers from number of limitations, like the arbitrary nature of both the zero and the hundred, imperfection of tools, inter & intra examiner variability etc

3 As a consequence of these limitations, the marks so awarded do not represent the true mark because of inherent errors of measurement

4 A random sample of size 'n' is drawn from a population, whose mean is μ and standard deviation is σ (which are unknown) Let the mean and standard deviation of the sample are 50 and 10, then the mean of population may lie in between

   a 40 and 60 in 68 % of cases.

   b 30 and 70 in 95 % of cases.

   c 20 and 80 in 99 % of cases

5 The negative effect of pass/fail system is going to be glaring day-by-day A child failed once in examination is labelled as failed through out his life As a result, the students are forced to even commit suicide

6 Inter- and intra-examiner variability in the marking of the script is so high that it decreases reliability of the scores

7 Marking system has increased cutthroat competition among the students leading to use of unfair means

8 Over emphasis on marks has made the present evaluation system inhumane,

9 Comparison of student's performance in various subjects on the basis of raw marks is irrational unjustifiable and inhumane

10 The system of pass/fail encourages commercialization of education

11 In pass/fail system there is a colossal wastage of humane resources at the national level

12 In marking system there is no provision for improving performance by the students if he/she is not satisfied

9.4 ADVANTAGES OF GRADING SYSTEM

1 The shortcomings of marking system can be overcome to a large extent if students are placed in ability bands that represent ranges of scores Each ability range may be designated with a letter called a "Grade"

2 Grades can fruitfully be used for recording the growth and development of individual students

3 Grades can be added meaningfully without distorting the scale of measurement, should we decide to arrive at the Grade Point Average (GP A)

4 Undue significance attached to raw scores will be considerably reduced

5. Grades will be minimally affected by test-difficulty

6 Negative effect of pass/fail will be eliminated, as the performance of individual student will be rated in terms of grades No grade signifies the failure of student in a subject rather it provides an opportunity to improve on it

7 Grades so awarded will indicate the relative position of the individual student vis-a-vis his/her group and thus serve the purpose of norm reference testing

8 Grades will provide for comparability even across the curricular areas because the normal distribution ensures the uniformity in spread of scores regardless of the nature of curricular areas

9 It may be naive to assume that a shift from marking to grading would remedy entire defects of the conventional system However grading is far more satisfactory a method

9.5 PRE- REQUISITES

Pre-requisites for any effective examination are

- Balanced Question Paper,
- Detailed Marking Scheme,
- Randomisation of the Answer Scripts, and
- Fair Conduct of Examination

9.6 METHODS OF ASSIGNING GRADES

1 In general, grading may be carried out by two methods

    a Direct

    b. Indirect

2 In direct method, the performance of the students is assessed in qualitative terms and is expressed in terms of letter grades.

3 In indirect method, the performance of the students is first assessed in terms of marks and subsequently transformed into letter grades by using different modes

4 Indirect grading methods may be of two types

    a Absolute grading

    b Relative grading

Appendix - I

Design of Paper

1.1 Weightage to Objectives

S.No.	Objective	Marks	Parcentage
	Total		

1.1 Weightage to Content

S.No.	Unit	Marks	Parcentage
U-1			
U-2			
U-3			
U-4			
U-5			
U-6			
	Total		100

1.2 Weightage to Forms of Questions

S.No.	Form	Marks	Percentage
1.	Essay		
2	Short Answer		
3	Objective		
	Total		100

1 3 Number of Question and Estimated Time

S.No	Form	No of Question	Total Marks	Estimated Time
1	Essay			
2	Short Answer			
3	Objective			
	Total			100

Appendix II

BLUE PRINT

Subject Science

Exam Matriculation
Max. Marks 100

Class VII
Time 3 Hrs

OBJECTIVE	KNOWLEDGE			UNDERSTANDING			APPLICATION			SKILL			TOTAL		
FORM OF QUESTION CONTENT UNIT	E	SA	VSA	E	SA	VSA	E	SA	VSA	E	SA	VSA	E	SA	VSA
[illegible]															

Note 1 Please put the number of question within brackets and the marks outside the brackets

2 Put ∟ to denote that marks have been combined to form one question

Summary

Essay or Long Answer	(E)	No of Question	Marks	=
Short Answer	(S A)	No of Question	Marks	=
		No of Question	Marks	=
Very Short Answer	(V S A)	No of Question	Marks	=
Scheme of Sections	⟨ Indicates internal option		Total Marks	=

Scheme of Sections

* Delete whichever is not applicabel

Appendix III

3.0 Scoring Key & Marking Scheme

Section - A

3 1 I Scoring Key

Q No.								Total
Answer								
Marks								

Section - B

3 2 II Marking Scheme

Q.No.	Out line of the expected Answer	Marks Allotwd to Blue Print	Total Marks
	Total		

3.3 Question wise Analysis

Q.NO	Objectives	Specification	Content (Topic/Sub-Topic)	Form of Question	Estimated Dificulty	Estimated Time in Min	Marks Alloted	Marks

E = Essay Type
S.A = Short Answer
VSA = Very Short Answer
O = Objectives type

[illegible] = Difficult
[illegible] = Average
[illegible] = Eas

List Of the Resource Persons

1. **Dr. A. K. Mohapatra**

2. **Dr. Shashi Prabha**

3. **Dr. S.C. Bhargava**
   (Programme Coordinator)

REGIONAL INSTITUTE OF EDUCTION
AJMER

Training of KRPs in Evaluation Techniques in Science at Sr. Secondary Level

(10th November to 14th November 2003)

Date	Training Time	Subject
10 11 2003	9 00 – 10 00 a m	Registration
	10 30 – 11 00 a m	Inauguration and objective of the workshop
	11 00 – 11 15 a m	Tea Break
	11 15 a m – 1 00 p m	Concept, Need and Salient features of evaluation
	1 00 – 2 00 p m	Lunch Break
	2 00 – 3 00 p m	Instructional objective
	3 00 – 5 00 p m	
11 11 2003	9 30 – 10 30 a m	Evaluation Techniques
	10 30 – 11 15 a m	Group work
	11:15 – 11.30 a m	Tea Break
	11.30 a m – 1 00 p m	Criterion – reference test and focus of questions
	1·00 – 2 00 p m	Lunch Break
	2 00 – 4 30 p m	Group work
	4 30 – 5 30 p.m	Presentation of group work
12 11 2003	9.30 – 11.30 a m	Design of question paper and blueprint
	11 15 – 11 30 a.m	Tea Break
	11 30 a m – 1·00 p m	Group work
	1 00 – 2 00 p.m	Lunch Break
	2 00 – 4·30 p m	Group work
	4:30 – 5.30 p m	Presentation by the groups
13 11 2003	9 30 – 10 30 a m	Grading in scholastic area
	10 30 – 11 15 a.m	Marking scheme and question paper analysis
	11.15 – 11·30 a.m	Tea Break
	11 30 a m – 1 00 p m	Preparation of question paper
	1·00 – 2·00 p m	Lunch Break
	2 00 – 4 30 p m	Group work
	4 30 – 5 30 p m	Finalisation of group work
14 11 2003	8 30 – 12 00 noon	Presentation and finalisation of question papers
	12 00 – 1 00 p m	Suggestion for improvement of question paper
	1 00 – 2 00 p m	Lunch Break
	2 00 – 3 00 p m	Subjectwise presentation of all the group activities
	3 00 – 4:30 p m	Valedictory

List of the Participants
Evaluation Techniques in Science at Sr. Secondary Level
(10th to 14th November, 2003)

S.No	Name	Address
1	Balwinder Kaur(Lecturer Chemistry)	Govt Senior Secondary School, Daulat Singh Wala, Ropar
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4	*Lalita Rani (Physics)*	*Govt. Senior Secondary School, Daulat Singh Wala, Ropar*
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10	Rajesh Kumar (Lecturer in Maths)	Govt Sr Sec School, Rupal Hari, Fatehgarh Sahib
11	Lakhbir Singh (Lecturer Physics)	Sepoy Jaswant Singh Govt. Sen Sec School, Bhasaur (Sangrur)
12	Sham Lal Gupta (Lecturer Biology)	Govt. Sr Sec School, Bhaini Bagha, Mansa
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19	Gurdeep Kaur	Govt Sen Sec School, Sialba)
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28	Gursimran Kaur	Govt Sr Sec School, Dyalpura, Distt Patiala
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